UG 21 1912


# JOURNAL OF ELECTRICITY

## POWER AND GAS

**Devoted to the Conversion, Transmission and Distribution of Energy**

Entered as second class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the act of Congress March 3, 1879.

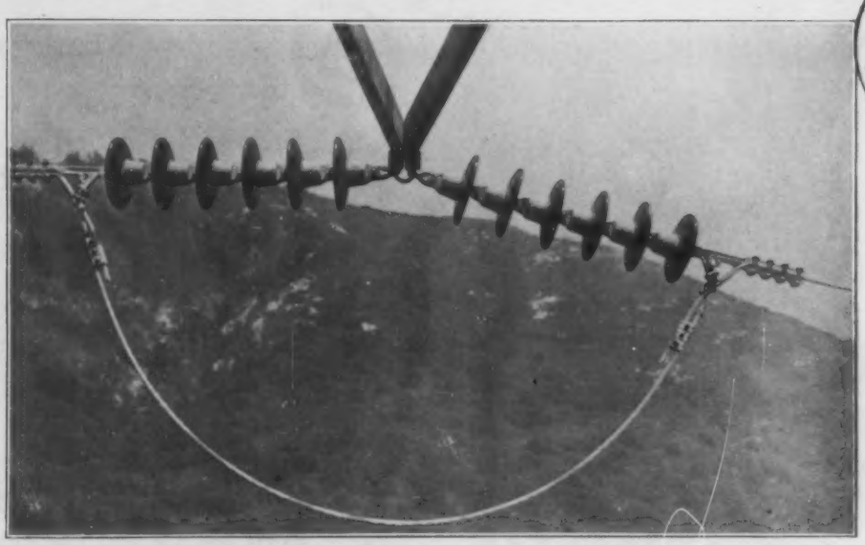
VOL. XXIX NO. 7 SAN FRANCISCO, AUGUST 17, 1912 PER COPY, 25 CENTS



# ALUMINUM WIRES AND CABLES

**EXTENSIVELY USED IN ALL PARTS OF UNITED STATES, CANADA AND MEXICO**

## FOR THE TRANSMISSION OF ELECTRICAL POWER



Showing method of dead-ending steel cored aluminum cable on 110,000-volt steel tower transmission line, using Locke type 2335 insulators

**Bare and Insulated Transmission Wire and Railway Feeders**

**STEEL CORED CABLE**

**Various Sizes of Cables in San Francisco Stock — Booklets upon request**

## PIERSON, ROEDING & CO.

SAN FRANCISCO PORTLAND SEATTLE LOS ANGELES

**Pacific Coast Agents ALUMINUM COMPANY OF AMERICA**


Where to Buy It in the West, Pages 9, 10, 12 Alphabetical Index to Advertisers, Page 8.

VENTILATION
the
problem
?

# G-E
# OZONATORS

**WILL SOLVE IT
FOR YOU**

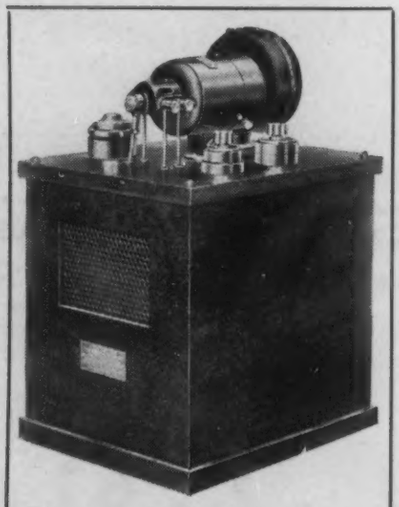
Keep the air pure, sweet and clear by the production of ozone in sufficient quantities to render harmless, foreign matters in the atmosphere.

Unexcelled for ----

Theatre - Hotel
Church - Hospital
Office - Factory - Basement
or Home use

For use on
Alternating or Direct
Current

***A child can operate them***



*The answer —*
**G-E Universal Ozonator**

*Ask the*

## Pacific States Electric Co.

**SAN FRANCISCO**
**OAKLAND**
**PORTLAND**
**LOS ANGELES**

B 273287


# JOURNAL OF ELECTRICITY

**POWER AND GAS**

**Devoted to the Conversion, Transmission and Distribution of Energy**

VOLUME XXIX SAN FRANCISCO, AUGUST 17, 1912 NUMBER 7


[COPYRIGHT 1912 BY TECHNICAL PUBLISHING COMPANY]

# COAST COUNTIES GAS AND ELECTRIC COMPANY

The Coast Counties Gas & Electric Company was organized during March of the present year. Numerous small corporations during past years have been supplying electric light, power and gas to Santa Cruz, Watsonville, Gilroy, Ben Lomond and a number of the other cities of Santa Cruz, Santa Clara, San Benito and Monterey counties. As is manifested in the modern trend of affairs, concentration of hydroelectric distribution seems to work out the highest economic law for all concerned. The past several months, hence, has seen the consolidation of the Coast Counties Light & Power Company, the Big Creek Light & Power Company, the San Benito Light & Power Company, together with the Union Traction Company of Santa Cruz, combined under one corporate management represented by the Coast Counties Gas & Electric Company.

The territory served is situated within the fertile valleys of the counties above enumerated. It extends from the towns of Morgan Hill and Ben Lomond on the north to Hollister on the south and westerly to the coast.

Indicative of the increase in consumers of the past three years is the following tabulation:

Steam Auxiliary Plant at Santa Cruz.

| Year. | Gas. | Electric. | Total. |
|---|---|---|---|
| 1909 | 1912 | 3095 | 5007 |
| 1910 | 2017 | 3539 | 5556 |
| 1911 | 2725 | 4627 | 7752 |

The company has in operation one hydroelectric generating plant known as Station A which has a capacity of 1080 h.p.; a steam plant known as Station B with a capacity of 1266 h.p. and a steam plant at Watsonville known as Station C, with a capacity of 1000 h.p. Power is also purchased from the Pacific Gas & Electric Company at their Davenport station;

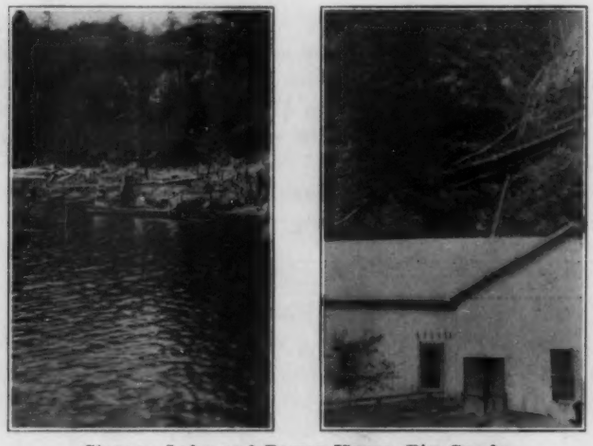
thus, continuity of service seems positively assured under all circumstances.

Three gas plants, situated at Santa Cruz, Watsonville and Hollister supply these growing communities with gas for cooking and heating. The street railway system of Santa Cruz is also controlled by this company.

The hydroelectric plant, referred to above, possesses interesting features, largely from a historical standpoint, for it is one of the oldest in the State of California, and for that matter, in the world, and yet today it is in efficient and continuous service.

### Station A.

Station A, situated in the picturesque Santa Cruz Mountains, bespeaks the rapid advance of the hydroelectric industry. The tall ferns and picturesque tree growth surrounding this plant on all sides is emblematic of the picturesque art now scarcely twenty years old.



Storage Lake and Power House, Big Creek.

The power house stands on Big Creek about sixteen miles west of Santa Cruz in Santa Cruz County, California. From Santa Cruz it is reached by driving along the Ocean Drive, although, should the Ocean Shore Railroad be completed, it will be within three miles of modern transportation facilities. This power house, which is shown in the illustration, is of wooden structure, characteristic of the early design in hydroelectric practice. Within are installed two Pelton water wheels with two nozzles each, one driving a 450 kw. generator and the other two 180 kw. generators. There are two small water wheels, the one used in driving an 11 kw. Westinghouse exciter unit and the other to drive two 2½ kw. exciter units. Both are directly connected to their respective water wheels. The generators are of Westinghouse 2-phase, 7200 alternation, 1100 volt type.

Water is brought to the wheels through a single penstock line, varying from 16 to 14 inches in diameter. The total length is 1930 ft. with a vertical drop of 925 ft. The pipe is made up of long shop-riveted sections which were joined in the field. On the upper part of the pipe are slip joints caulked under steel collars. This steel pressure pipe is laid for the lower half of its course down the bottom of a step gulch and is designed to convey 40 cu. ft. of water per second at a velocity of 24 ft. per second.

The pipe line takes the water from a wooden forebay, which is at an elevation of 1116.9 feet above sea level and discharges it at an elevation of 191.9 ft. This wooden forebay, in turn gets its supply of water from a wooden flume line, which heads in Big Creek at an elevation of 1146.5 ft. The flume is 11,200 ft. in length and hence has a grade of 29.6 ft. in 2.12 miles. At a point 3400 ft. below its head the flume has an intake for waters from a branch of Big Creek known as West Fork and the same wooden forebay into which this flume discharges and from which the pipe line takes its water, also receives water from Mill Creek which is the drainage area next west of Big Creek.

The water from Mill Creek is delivered through a small wooden flume installed upon a much steeper

Type of Flume at Big Creek Illustrative of Early Design.

grade than the flume in Big Creek. The Big Creek flume is 18-28 in. and of double 1-in. redwood on a grade of 2.64 ft. per 1000.

The methods used in constructing a reservoir in the early days of hydroelectric practice are of much interest as showing the lines from which more recent practice have evolutionized. There are at present three storage reservoirs on the system. The Mill Creek reservoir is held by a wooden crib dam 50 ft. high which was partly filled by hydraulic means and partly by scraper. The dam is at an elevation of about 1400 ft. above sea or 250 ft. above the intake of Big Creek flume. It is a composite structure of great bulk. The down stream portion is a crib of large redwood logs filled with earth and rock and sheathed on its upstream face with seven inches of plank. Resting against this planking is a heavy hydraulic fill made up of decomposed granite. In washing this in place, the decomposed granite was so solid it had to be blasted. From an inspection of the dam

at this date it is believed that when the crib portion of the dam entirely rots away, the hydraulic fill on the up-stream side will have become reasonably tight and hence perform its functions without the aid of the crib. The dam is 500 ft. long and floods 18 acres and is tapped at a depth of 46 ft. The storage is about 350 acre feet and represents 254,000 kw. hours measured on the switchboard under a 1000 ft. head and 71 per cent efficiency. The outlet of the reservoir is from two 14-in. steel pipes with gates at the lower end. The drainage area serving this reservoir is one square mile. It is assumed that the average run-off is 1330 acre ft. with a minimum of 700 acre ft. In other words, that during years of deficient rain fall, the drainage area would yield twice the fill of the reservoir.

The waters from this dam are backed up ½ mile lower down by a small concrete dam which delivers them through a small flume 2½ miles long to the forebay or reservoir. About three-quarters of the length of this flume is an earth bridge built with an excavation of about 1/3 cu. yd. per linear foot. Near the head

Type of Dam, Big Creek Reservoirs.

is a trestle 350 ft. long and 75 ft. high. The workmanship on this trestle constitutes an illustration of efficient construction and to this day is in good operating condition. The flume is made of three boards, each 16 x 1¼ in. redwood. Yokes are 4 ft. center to center, sills are 2x 6, posts and caps 2 x 4.

The second storage is a forebay reservoir excavated in earth and rock on the ridge or divide between Big Creek and Mill Creek. This reservoir is about 300 ft. long and contains about 30,000 cu. ft. of water, which in the present power house will generate about 400 kw. hours. The wooden waste way from this forebay reservoir discharges back into Mill Creek. Water is received from the Mill Creek flume and from the Big Creek flume and then fed through a wooden penstock box into the pressure pipe.

The third storage known as the West branch reservoir on the west branch of Big Creek is situated at such an elevation that the outlet pipes discharge at an altitude of 1190 ft. above sea level. The type of construction is known as the rafter plan, that is to say, that it is made up of an inclined face sloping down stream held in place by inclined struts sloping up stream. It rests on a crib of horizontal timbers. The dam is 35 ft. high by 450 ft. long on top. The lower crib is filled with earth and rock. The wooden sheathing is backed on the water side by a light earth fill to render it more water tight. The outlets to this dam are through 14 in. and 16 in. pipes of sheet steel 3/32 in. thick with gates at their upper end under the water of the reservoir. The gates are controlled from a little platform reached by a plank footway leading over the dam. The waste-way is a wooden trough in the center of the dam. From the outlet of the dam the water is discharged into the West Fork whence it falls down over a waterfall and discharges into the flume which is at an altitude of 1135 ft. Hence there is a drop of 55 ft. from the pipe outlet of the dam to the top of the flume.

The waters of this dam flood some 12 acres, bringing about a storage of about 38 acre feet which represents 100,000 kw. hours power supply at the present power house. The drainage area tributary to this dam is 12 square miles, from which the run-off in average years would be about 2500 ft. or about 18 times the fill of the reservoir.

In the power house are found transformers arranged for Scott connection in order to deliver energy to the extensive three-phase system of the Coast Counties Gas & Electric Company. There are two 400 kw:. 1100 to 11,000-volt, one 250 kw., 1100 to 11,000-volt, and four 75 kw., 1100 to 11,000-volt transformers.

Although this constitutes the third oldest hydroelectric transmission plant in the State of California, having been put into operation in 1895, it is nevertheless today rendering good and efficient service to the extent of the water supply control in the various seasons of the year.

### Station B, Santa Cruz Steam Plant.

The steam plant known as Station B, presents an outward appearance neat and attractive and in full keeping with California traditions. Its plastered exterior with tile roofing fully reminds one of the Spanish traditions among which the plant is located.

Installed in this plant may be found a 500 kw., 2200 volt, 2-phase, 60-cycle General Electric generator. This generator is directly connected to a Curtis vertical steam turbine of 500 kw. capacity. A 11 kw. General Electric exciter is belted to a 16 h.p. Sturtevant engine.

In addition to the turbine installation there is also a 200 kw., 600-volt, direct current General Electric generator belted to a 150 h.p., 1000-volt, 2-phase, type C Westinghouse induction motor. In case of a shutdown of the power supply, ample facilities are also provided by which this direct current generator may be belted to a Fitchburg steeple compound engine which is 16, 20 x 20. There is also still another General Electric 200 kw., 600-volt direct current generator belted to a second Fitchburg steeple compound engine 16. 20 x 20 in.

Three motor generator sets are also found among the equipment in this plant. A 400 kw., 600-volt d.c. General Electric generator is directly connected to a 500 h.p., 2200-volt, 2-phase, 60-cycle General Electric synchronous motor. A 5 kw. General Electric exciter is belted to the synchronous motor for magnetizing the field. A 100 kw., 575-volt direct current Westinghouse generator is directly connected to a 75 h.p., 220-volt, 2-phase, type C Westinghouse induction motor, while still another unit consisting of a 90 kw., 575-

volt d.c. Westinghouse generator is seen to be directly connected to a 75 h.p., 220-volt, 2-phase, type C induction motor.

Two 44 kw. line voltage regulators of the General Electric automatic I. R. S. type, together with switchboard and instruments make up the regulating equipment.

Steam is generated for the power supply in Babcock & Wilcox boilers. Two double drum boilers built for 160 lb. pressure with drums 20 ft. 4 in. long, 36 in. in diameter, with 4 in. tubes, 14 wide and 9 high having a rating of 300 h.p. are in one battery. A second battery of boilers consists of three single drum units built for 160 lb. pressure with drums 18 ft. 4¾ in. long with 4 in. tubes 9 wide and 7 high. These have a capacity of 150 h.p.

Three 50-light General Electric mercury arc rectifying outfits control the arc light circuits. The transformers are water cooled, arranged for Scott connection. There are two 440 kw., 22,000-2200 volt transformers and also two 150 kw. transformers with similar ratios of transformation. All are of the Westinghouse design. That portion of the current supplied to the mercury arc rectifiers is handled by three 50-light constant current transformers.

Among the auxiliary apparatus are to be found two boiler feed pumps of the Snow design, 6 x 4 x 6 in. The oil pumps for the turbine supply, 6 x 2 x 6 in., bear the Worthington stamp, while the two oil pumps, 4½ x 2¾ x 4 in., of the Snow design are used for the reciprocating units. A dry vacuum pump 6 x 14 x10 in. and an air compressor 7 x 10 x 6 x 8 in. are utilized to maintain proper vacuum conditions in the condenser. The condensers are of the Wheeler design, two in number, one having 800 ft. and the other 1800 ft. of condensing surface. A Goubert water heater with a capacity of 1000 h.p. completes the steam auxiliary equipment.

The building, though fireproof in construction, has in addition ample fire protection by means of its high pressure water supply. Faucets are located throughout the building and a 60-lb. pressure is maintained at all times to operate pumps in case of shortage from the regular supply.

### Watsonville Steam Plant.

The Watsonville steam plant, although installed some years ago and in many respects not equipped with the most modern machinery is, nevertheless, operated whenever occasion demands auxiliary supply. The main equipment consists of a 750 kw., 2200-volt, 2-phase Westinghouse generator which is directly connected to a McIntosh & Seymour cross compound condensing engine with cylinders 21 x 42 x 4 in. A 20 kw. Westinghouse exciter is directly connected to the generator shaft.

The steam supply is derived from two double drum Babcock & Wilcox boilers which operate at 160 lb. pressure. The drums are 20 ft. 4 in. long with a diameter of 26 in. Tubes of 4 in. diameter are placed in the boiler, 14 wide and 9 high, thus giving a rated capacity of 30 h.p.

Two feed pumps of the Snow design supply the water, a Goubert heater from which the water is taken to the boiler, a set of Snow oil pumps, a Wheeler condenser with 2800 feet of condensing surface, an Edwards air pump, and an 8 in. d. c. centrifugal engine-driven circulating pump complete the auxiliary steam equipment.

The transformers are of the Westinghouse design and are equipped for the Scott connection. There are two which have a capacity of 250 kw. each and a ratio of transformation of 2200-22,000 volts. They are oil insulated and air-cooled. Two 22 kw. General Electric automatic I. R. S. line voltage regulators maintain proper voltage conditions.

### The Union Traction Company.

The Union Traction Company, a subsidiary of the Coast Counties Gas & Electric Company, which operates the traction lines in and about Santa Cruz, presents interesting features. The special car arrangement with the Casa del Rey Hotel wherein a bus equipment is done away with is unique and suggestive of similar combinations in other coast resorts. The company furnishes a private electric car which conveys the guests arriving at the depot directly to the hotel.

Type of Car, Union Traction Co.—Santa Cruz.

The car barns situate on Pacific Avenue and Sycamore street, maintained by the company, possess many features looking toward usefulness and ethical development of employes. The lockers and changing rooms provided are commodious and sanitary. Four separate tracks are maintained in the main room These have concrete pits in order to have easy access for cars undergoing repair. Fire protection is maintained throughout the car barn equipment.

The repair work for the gas plants in addition to the heavy work for the cars is done at these shops. One room, 18 x 18 ft., is maintained for armature winding where the company has an expert in this line of work. A foundry room for brass is kept in efficient condition. In addition, anchor rods, iron pins and wagon work are also put out when occasion arises.

In the rear, without the building, an efficient equipment is maintained to prepare the gas pipes for the "English coal tar" preparation. The pipes are capped with wooden plugs after being heated to a sufficient temperature, then dipped in tar and put on a vertical drain. Two men are all that are necessary in handling this equipment. The gas pipes are mostly of 2 in. in diameter for the high pressure system, the pressure maintained for distribution being from ten to fifteen pounds.

As shown in the photograph, the cars are of sub-

Concrete Bridge, Union Traction Co.—Santa Cruz.

stantial design. All cars of the company are painted blue which undoubtedly is done in order to be indicative of the summer atmosphere and the surroundings found here. Rails of 60 lb. weight are used in construction of the track. The cross ties employed in the road work are from the heart of the redwood. The ties are of the split design and though installed in 1907 are today in perfect condition.

The management has found that one man with an electric automobile can set as many meters as two men with a horse and wagon and as better service is thereby maintained, the meter department is operated with the former mode of conveyance. At Watsonville are maintained a car for the gas service and one for the electric, at Hollister one electric and one gas car are kept in service, while at Gilroy, where the company has leased the municipal plant, a gas car is maintained in service.

The management of the company pursues a liberal policy and the first sign that meets the glance of the consumer as he enters the company's office is the following: "Suggestions for improvements in either electric, gas or railway service cordially received. Please place in this box. General Manager." Immediately below this sign is a box where these suggestions may be deposited and this has enabled the management to give the high class service maintained in the past.

### Electric Circuits.

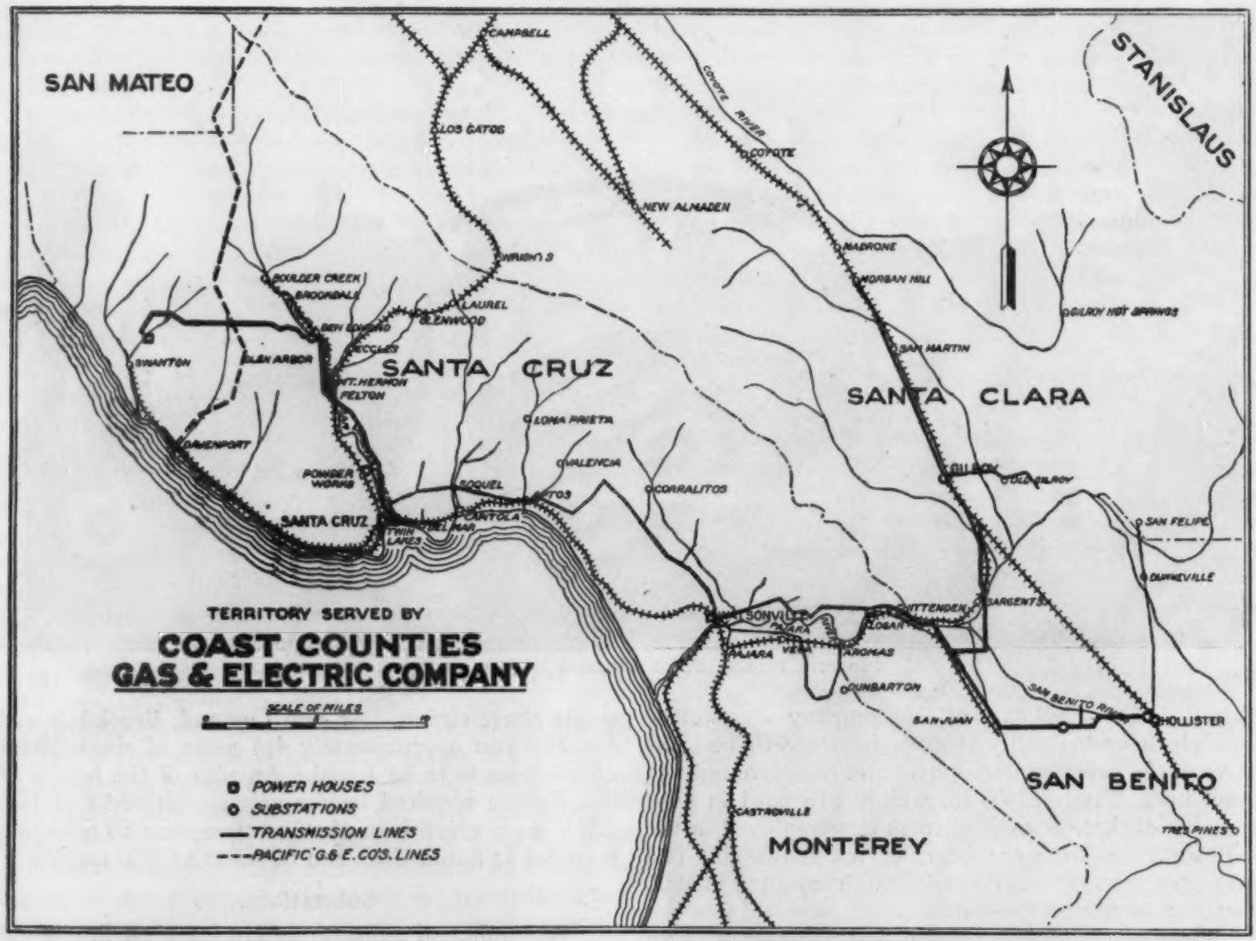
There are in the high tension net-work 41 miles of No. 4 copper and 21 miles of No. 6 copper 3-phase transmission which is maintained at 22,000 volts. In Santa Cruz, the distributing circuit, which is 2200 volt, approximates 8 miles in length and of 2-phase distribution, and another circuit 24 miles in length, of single-phase distribution. The Watsonville network comprises distribution at 2200 volts with a 25-mile 2-phase circuit and a 10-mile single-phase circuit. At Gilroy similar voltage distribution is maintained with 13 miles of 3-phase circuit and 5 miles of single-phase circuit. At Ben Lomond, Brookdale and Mt. Hermon approximately 4½ miles of single-phase distribution is to be found. An idea of the length of distribution required in low voltage networks of 110-220 volts is given from the fact that some 50 miles are installed at Santa Cruz and 30 miles at Watsonville.

### Substations.

A number of substations are installed in the extensive distribution system of the company, the more important of which are as follows:

Hollister Substation.

At Powder Mill, four 3-pole 22,000-volt air-brake switches with two 22,000 meter outfits are installed. At Larcen may be found one 2-pole 22,000 volt air-break switch with a meter outfit sufficient for a 10 h.p. motor. The Spreckels substation contains one 2-pole, 22,000-volt, air-break switch, two 5 kw. 11,000-220-volt transformers and a 220-volt meter outfit.




At Lilliancrantz is installed one 2-pole, 22,000-volt, air-break switch, two 10 kw., 11,000-220-volt transformers and a 220-volt meter outfit. The Granite Rock substation contains a 3-pole, 22,000-volt, air-break switch, an oil switch of similar proportions. Three 75 kw. and two 50 kw. 22,000-440-volt transformers are also installed at this distribution point, together with two meter outfits.

At Gilroy a 3-pole, 22,000-volt, air-break switch with an oil-break switch of similar proportions, together with a General Electric automatic I. R. T. line voltage regulator are to be found. Two 75 kw. 22,000-2200-volt transformers with switchboard and instrument complete make up the equipment.

At the junction of the point of the former San Benito distribution lines, a 22,000-volt metering outfit is maintained, while Brookdale has a switchboard with adequate meters and Mt. Hermon a metering outfit for the connected load found there. Ben Lomond has in its substation a 75 kw. 22,000-2200-volt transformer. Control is maintained through a 3-pole 2200-volt air-break switch and 2-pole air-break switch of similar proportions, a switchboard and necessary instruments complete the equipment.

In Santa Cruz 1732 poles and 1593 kw. in distributing transformers is required to supply the 2542 consumers. In Watsonville 989 poles and 936 kw. in transformers is necessary to supply the 558 consumers.

### Gas Works at Santa Cruz.

The rapid growth to 1608 gas consumers at Santa Cruz which is supplied through mains aggregating a total length of over 31 miles has brought about an efficient system of gas generation. The company has voluntarily reduced its rates and during recent weeks the following block system has been put into effect, which materially reduces the former rates in vogue:

| | Gross per M. | Net per M. |
|---|---|---|
| First 2,000 cubic feet per month | 1.50 | 1.40 |
| 2,000-20,000 cubic feet per month | 1.35 | 1.25 |
| 20,000-30,000 cubic feet per month | 1.25 | 1.15 |
| Over 30,000 cubic feet per month | 1.10 | 1.00 |

The 10c per 1000 cu. ft. discount is allowed on all bills paid at the office before the 10th of each month.

The gas works at Santa Cruz consists of a 10,000 and 5000 cu. ft. Lowe generators. Four purifiers 8 x 8 x 5 ft. relieve the gas of sulphur ingredients. Two gas holders—one 30,000 cu. ft. and the other 20,000 cu. ft. capacity are installed. A 10 x 10 in. electrically driven compressor and a 10 x 12 in. steam driven compressor segregate all harmful ingredients from the gas which have passed the purifiers and before the same is taken into the city distribution mains.

An engine driven exhauster of 18,000 cu. ft. capacity, together with an 8 in. exhauster of 18,000 cu. ft. capacity, and an 8 in. engine drive blower complete this phase of the equipment. Two boilers of twenty and eighty h.p. of Babcock & Wilcox design are maintained in readiness in case of discontinuity in electric supply for operation of the gas plant.

### The Watsonville Gas Works.

The Watsonville gas works, though small and of long standing, is, nevertheless, most efficient in its operation. The equipment consists of a 5000 and a

2500 cu. ft. Lowe gas generator. Two purifiers 10 x 10 x 5 ft., two holders, one 30,000 cu. ft. capacity and the other 10,000 cu. ft. capacity, complete the main equipment. A 10 x 12 in. steam driven compressor and two boilers of Babcock & Wilcox design, the one 40 h.p. and the other 20 h.p. capacity, complete the steam generating equipment of the plant. There are 761 gas consumers in Watsonville and the distribution system comprises over 12½ miles.

The Coast Counties Gas & Electric Company control blanket franchises covering the use of all highways in Santa Cruz, Monterey, Santa Clara, and San Benito counties, also franchises in the cities of Santa Cruz, Watsonville, Gilroy, Morgan Hill, San Juan and Hollister.

Electrical Pumping Plant, San Juan Valley.

The franchises in Gilroy grant the use of certain highways for lines through the city to reach the surrounding country but provide that the company must not compete with the municipal plant. This plant is now, however, being operated under a five-year contract by the Coast Counties Gas & Electric Company.

Pajaro Valley is typical of the tributary district. The area of the valley comprises about 120 square miles or 76,800 acres. Rain rarely falls between May 1st and October 1st. The industry of first importance is that of growing apples. The climate and soil of the valley is particularly adapted to this purpose and the production and shipments are greater than any other single district in the world. More than 4000 carloads or 2,500,000 boxes comprised the shipment last year.

Next in relative importance is the berry crop. Strawberries, blackberries, loganberries, raspberries and other varieties thrive here and during the season as many as 5,000,000 lbs. have been marketed. Apricots, prunes, grapes, pears and cherries are produced in commercial quantities. Oats, barley, hay, alfalfa, sugar beets and potatoes are profitably grown. Stock raising and dairying constitute important industries, while poultry raising is recognized as of immense future profit to growers in this district

The Hollister Valley is of similar productive proportions. This valley spreads fan-like from about and above the town of Hollister and embraces about 20,000 level acres. Naturally moist with a sedimentary soil of great depth, rich in plant food and easily cultivated, this valley is just now coming into its own. San Juan, which was once part of a princely estate of about 1,000,000 acres given away by the Mexican government and known as the Spanish Grant, is another valley of promise. In this valley are more than 20 square miles composed of as fine land as any country can show. Like the Hollister Valley, the soil is a rich alluvium, very deep and underlaid with artesian water and suitable for all kinds of high priced crops.

Shot Gun Alarm at Hollister.

San Benito County has two sources of water supply, gravity ditches and artesian wells. The San Benito Water Company now furnishes 3000 acres but is extending and improving the system and will shortly cover 10,000 acres. Irrigation has increased land values in this section $2,000,000 and will continue to add immensely to the productive capacity of the land as the area is enlarged.

The artesian belt is making a rich district around San Felipe. The wells do not as a rule flow; hence the use of pumps is general. The lift averages 15 ft. and cost of electric pumping is about $1.00 an acre per year to put water on the ground in proper proportion. The possibilities for future consumption of electric power from this source is of enormous proportions.

Illustrative of the natural genius involved in a new country under new conditions is the photograph shown herewith, showing an irrigating canal and shot gun. An industrious farmer in his endeavor to cut down operating expenses, in other words to do without the employment of another man to watch his irrigating supply, has installed a shot gun, the trigger of which is attached to a float in the ditch below. If for any reason a discontinuity in the water supply occurs and the water goes below its accustomed level, the shot gun is automatically fired and the rancher is thus notified even though he be industriously engaged in a distant corner of his ranch.

## HOW THE CHICAGO AND CLEVELAND STREET RAILWAY SETTLEMENTS ARE WORKING OUT.[1]

BY DELOS F. WILCOX.

There are many types of street railway franchises in operation in the United States, but the only two cities which have thus far worked out general street railway settlements of national importance and national interest are Chicago and Cleveland. Chicago has an area of about 190 square miles and a population of 2,185,000, according to the last census, or nearly seven times the population of Los Angeles. Cleveland is a much smaller city, having only a little more than 40 square miles of area and a population of 560,000 in 1910. The two cities may be compared from a street railway standpoint by stating that the total number of passengers carried on the surface street car lines in Chicago is almost 600,000,000 a year, while in Cleveland the number is a little more than 200,000,000. The larger number of riders in Cleveland in proportion to population is accounted for partly by the fact that the elevated roads in Chicago handle a large part of the local passenger traffic, and partly to the fact that in Cleveland traffic has been stimulated by the lower fares. The relative magnitude of the two cities from the street railway standpoint may also be seen from the fact that the recognized capital value of the Chicago systems on February 1, 1912, was about $127,500,000, as against about $24,500,000 for the Cleveland property as of February 29, 1912.

### Chicago.

The Chicago settlement ordinances have been in operation for a little more than five years and the Cleveland ordinance for a little more than two years. The practical administration of the Chicago ordinances had been under the direct supervision of Bion J. Arnold, who, aside from Mr. Walter L. Fisher, was the chief factor in the original negotiations. The administration of the Cleveland ordinance was for the first two years in the hands of a stranger. Both Tom L. Johnson and Judge Robert W. Taylor, the two men most responsible for the Cleveland settlement, died soon after the ordinance went into effect. Since January 1, 1912, however, the administration of the ordinance has been in the hands of Newton D. Baker, now mayor of Cleveland, and Peter Witt, City Street Railroad Commissioner, both of whom were trusted lieutenants of Tom Johnson.

The Chicago ordinances were the outgrowth of many years of financial exploitation, political corruption, intolerable service, stubbornly contested litigation and prolonged public agitation almost unparalleled in the history of the American cities. During the preliminary period the people of Chicago became converted to the principle of municipal ownership, but found themselves so entangled in constitutional and statutory restrictions, so lost in administrative chaos, and so handicapped by the fag ends of unexpired privileges, that the great, rich city of Chicago, could not, absolutely could not, buy up the antiquated junk which passed for a street railway system, and itself undertake to rehabilitate and build up a transportation utility worthy of a progressive city. The city had statutory authority to acquire and operate street railways, but as finally interpreted by the Supreme Court of Illinois, this authority was subject to financial conditions which the city could not possibly fulfill. In other words, one law gave the city powers which other laws prevented it from exercising. On the other side the franchises were expiring and in a notable decision, the United States Supreme Court definitely denied the companies' most important claims. Yet the companies were in possession of the streets, and the railways, wretched as they were, had to keep going. A great city of two million people clamored angrily and persistently to be carried in decent cars at a reasonable speed. The great issue was better service, and municipal ownership as a means to get it. The deadlock could not continue. Out of these impossible conditions strong men fashioned a compromise and drove it through. The city was unable legally and financially to get immediate municipal ownership, but it could not postpone any longer the immediate rehabilitation of the system and the service. The surface street railways of Chicago, barring certain comparatively unimportant outlying lines, were operated by two companies, which served separate districts, but had access in common to the business heart of the city. The settlement ordinances applied to both companies.

To smooth the way for municipal ownership, the existing properties were appraised and the value was written down in a book at the round figure of $50,000,000, twenty-nine millions for one system and twenty-one millions for another. It was agreed that the new capital required for the reconstruction, re-equipment and extension of the lines should also be written down in the book from time to time and added to the original valuation. The sum as shown was to be the purchase price, and the city would have the option at the end of any period of six months to walk up to the counter, lay down the price, and walk off with the goods. All the uncertainties of future appraisals, litigation, corporate resistance and complex disputes were wiped out. The purchase price was fixed. City money, whenever it was forthcoming, would talk. This particular option, however, would not be effective during the first period of twenty years, except for municipal operation, although if the city itself could not take over the property for municipal operation, it could organize a licensee company limited to a 5 per cent profit, and the latter could take over the street railways to operate them as trustee for the city's benefit, by paying the same purchase price. Moreover, the city could designate as its licensee and properly authorized new company, not limited as to profits, and in that case the licensee could take over the property by paying the purchase price plus a bonus of 20 per cent. After twenty years this bonus would not be required. In the meantime, the roads were to be rebuilt and re-equipped and not less than a specified minimum mileage of extensions was to be added each year. A board of supervising engineers, consisting of Mr. Arnold as chief engineer and chairman, a representative of the city, and a representative of the company in each case, was established, principally for the purpose of supervising the work of rehabilitation, certifying additions to capital, and determining what expenditures should be charged to the various accounts. On the companies' actual expenditure for capital account, they were to be allowed certain additional amounts—10

[1]Paper read before the National Municipal League, Los Angeles, Cal., July 12, 1912.

per cent for contractors' profit and 5 per cent for brokerage. Moreover, for the three-year period fixed as the period of "Immediate Rehabilitation" 70 per cent of gross receipts was arbitrarily set aside for operating expenses, and it was provided that anything spent for renewals during this three-year period in excess of what might be available for that purpose out of this 70 per cent should be added to capital. Street railway fares were fixed at 5 cents for adults and 3 cents for children between seven and twelve years of age. Children under seven properly attended, were to be carried free. Except in the downtown business district, comprising an area of about 2/3 of a square mile, free transfers were to be given that would enable a passenger to ride from any point on either system to any other point on either system, not involving a return trip. Through routes were to be operated over both systems as listed in the ordinances. The companies were to be allowed five per cent interest on the recognized capital value or purchase price as written down in the book. This allowance was to come after operating expenses, including maintenance, renewals, accident reserve and taxes. Specific percentages of revenues, subject to modification by the board of supervising engineers, were to be set aside to insure the upkeep of the property to the highest practicable standard of efficiency.

After the companies had withdrawn their 5 per cent return on capital, the net profits were to be divided in the ratio of 55 per cent to the city and 45 per cent to the companies. It was stipulated that the city's share of the profits should be placed in a fund for the purchase and construction of street railways. The expenses of the board of supervising engineers were to be charged to capital account during the three-year period of immediate rehabilitation, and thereafter to operating expenses. Mr. Arnold's salary as chairman of the board was fixed at $15,000 a year, and he was allowed $15,000 a year additional as chief engineer during the period of reconstruction. In case the companies failed to comply with the provisions of the ordinances for a period of three months exclusive of time during which, without their connivance they were delayed or interfered with by unavoidable accidents, labor strikes or court orders, their rights under the ordinances might be forfeited, but in any such case the rights of mortgagees to recover by foreclosure up to the full value of the property as reflected in the purchase price, were not to be affected. In other words, forfeiture was run against the operating companies, but not against their bond holders unless and to the extent that bonds had been issued in excess of the value of the property.

How has this scheme worked? Chicago has got a physically reconstructed, high-grade street railway system. Practically all the small outlying lines have been brought into the scheme and are now being operated by one or the other of the two companies. This means a universal five-cent fare for adults and free transfers throughout the city, except in the downtown business district. This limitation of the transfer privilege was designed to prevent abuses. It operates to the inconvenience of a number of people who have to walk from a block or two to perhaps a third of a mile to reach their downtown destination, or else pay a second fare. The through-route provisions of the ordinance have not yet been worked out satisfactorily, largely as a result of the jealousies and conflicts of interest of the two companies. Only 9 per cent of the cars entering the business district are through-routed, with the result that a passenger desiring to pass through the heart of the city must submit to considerable delay in waiting for a through car or in making a detour by transfer around the business district, or must change companies and pay a second fare. Downtown traffic is badly congested, partly by reason of the fact that 91 per cent of the cars switch back or go around short single track loops, crossing and recrossing each other's routes with resultant confusion and delay. Service is generally good so far as physical equipment is concerned, but there are serious complaints of overcrowding during the rush hours. No trailers are used.

The original purchase price, including the smaller properties since brought under the ordinances, was $55,775,000. On February 1, 1912, after five years, their aggregate purchase price was $127,492,398.37, an increase of 128 per cent. During the five years period the companies had received about $22,000,000 as interest on their investment, $6,432,183 as their 45 per cent of net profits and about $9,000,000 as their percentages of profits on rehabilitation, a total of approximately $37,500,000 or the equivalent of 8.5 per cent per annum on their investment as shown by the purchase price. During this same period taxes paid to the city and other public bodies amounted to about $4,800,000 and the city's share of profits amounted to $7,804,000.

The Chicago Settlement Ordinances are a great constructive work of municipal statesmanship. They are the practical outcome of the first big battle in this country to recover for a great city the control of its streets. In the light of Chicago's experience, many other battles will be fought before the cities of America have attained the complete ownership and control of their highways, which is, in my opinion, a prerequisite to the full realization of civic democracy, the assumption by the city of the self control necessary to transform the cities in which a few of us now grow rich and many of us now grow poor, into cities in which we may all live a full and free life.

Certain serious mistakes in Chicago's policy have been revealed as the result of five years' experience. The possibility of municipalization was intended as a check upon the companies. In fact these ordinances were represented as giving them one last chance to make good as servants of the people. The sword of municipal ownership being suspended at all times above their bowed necks by a slender thread. In five years' time that slender thread has grown mighty stout, until timid capital all over the country is clamoring for a chance to bed its neck under a sword suspended by that kind of a string. While the city has been accumulating a purchase fund of about $8,000,000, the purchase price of the property has increased nearly $80,000,000, and the companies have been making 8 per cent on that price. At this rate, Chicago will not be likely to continue long to regard as of great practical value, the simple announcement of its famous

contract: "Just walk up with the money and you can walk off with the street railways."

The mistakes of the Chicago Ordinances are mainly three:

1. They permanently capitalize many millions of dollars of franchise values, superseded properties, city pavements and construction profits, which never should be capitalized at all except as a last resort, and in that case should be amortized out of earnings as a first charge after the payment of their interest rates on the investment. It is impossible to tell from the figures available just how much of the purchase price of the Chicago street railways represents bona fide present value of tangible property. I believe, however, that at least 20 per cent or 25 per cent of the purchase price represents elements that never should be permanently capitalized. In fact, it is fairly certain that in the process of rehabilitation, more dead capital has been added to the account than the entire accumulation of the city's purchase fund.

2. The second mistake in the Chicago Ordinances is their failure to provide for the investment of the city's purchase fund, in the securities of the street railway system. While the companies are pouring new millions of capital into new car lines and getting 5 per cent brokerage and 5 per cent a year as a minimum return, the improvident city puts its money into the bank and gets 2¼ per cent interest on it.

3. The third serious mistake of the Chicago plan is the indefinite and inadequate provision for the permanent supervision of service by the board of supervising engineers after the expiration of the reconstruction period. The ordinances are not very clear on this point, but the board is unquestionably very limited in its initiatory jurisdiction over service matters.

### Cleveland.

Turning to Cleveland, we find a franchise settlement of another type. There, as in Chicago, the ordinance finally adopted was the outgrowth of years of litigation and political struggle. But in Cleveland the service had not been so badly neglected and the corrupting activities of the street railway interest had not been so bold and brutal. The main struggle in Cleveland was for lower fares, with municipal ownership as soon as conservative Ohio would permit it. Tom Johnson, as a practical railway man and a radical civic statesman combined asserted the practicability of three-cent fares and pending the working out of the municipal ownership program, demanded politically that the street railway company of Cleveland should be deprived of its monopoly profits. Unable to attain his purpose by negotiation, he did not hesitate to establish a competing line under franchise practically granted by himself to himself as trustee for the public. My time does not permit of a review of Johnson's long fight. The settlement known as the Taylor ordinance was finally put through in the face of Mr. Johnson's personal opposition and went into effect March 1st, 1910. Under this settlement the value of the property was agreed upon, as in Chicago, and provision was made for additions to capital account from time to time, subject to the city's approval. As yet Cleveland does not enjoy even the theoretical right to own and operate street railways, but looking to the future, the ordinance reserves to the city the right, when it is legally competent, to take over the property at the recognized capital value plus a bonus of 10 per cent on the portion of that value not represented by bonds.

The city is also authorized to designate a licensee company which will be permitted to acquire the property at the same price on the condition that it will agree to accept a smaller return by at least ¼ of 1 per cent on the portion of the capital value represented by capital stock than the original company is at the time entitled to receive. But the original company must be allowed to submit a bid before a licensee is designated, and no licensee may be designated unless it underbids the original company. At the expiration of the franchise or any renewal of it, the bonus will not be required as a part of the purchase price.

Aside from the provisions for purchase, the main idea of this ordinance is that the company shall receive a fixed rate of return upon its investment, and all surplus profit shall be prevented by an automatic readjustment of fares in accordance with a detailed schedule in the ordinance itself, which provides for a range between a maximum rate of 4 cents cash fare, seven tickets for a quarter, and one cent for a transfer, without rebate, to a minimum rate of 2 cents cash fare, one cent for a transfer and one cent rebate when the transfer is used. Between these extremes are eight intermediate variations in the rates. When the ordinance went into effect, the rate was three cents cash fare, one cent for a transfer and no rebate. A certain fund was established to operate as the financial pulse of the street railway system. This fund was started off at $500,000, and it was provided that whenever the fund increased to beyond $700,000 the fares should automatically be lowered, and whenever the fund went below $300,000 the fares should be raised. In case of dispute between the city and the company about the necessity of a change of fare other than by this automatic arrangement, the matter was to be submitted to arbitration. But in case the city ever let the franchise come within fifteen years of expiration, the company should be entitled to charge a maximum rate provided for in the schedule, and apply all surplus profits to a reduction of capital, which would, in case of subsequent purchase by the city, go to reduce the purchase price. The company was allowed a fixed amount, 11½c per active car mile of motor cars and 60 per cent. as much per car mile of trailers, for operating expense, and also a fixed amount per car mile for maintenance, renewals and depreciation. This latter allowance varies with the seasons, but averages about 5c per car mile. These allowances may be changed by agreement or by arbitration. The company is allowed to withdraw each year from the interest fund a sum equal to six per cent. on its bonds. New stocks and bonds may be issued, but, unless approved by the city, they do not become a part of the capital value.

The city appoints a street railroad commissioner, whose offices and supplies are furnished, and whose expenses and salary are paid by the company as an operating expense. The amount of the commissioner's salary is limited to $12,000 a year. The present commissioner gets $7,500, the same as the heads of the other city departments. The expenditures for salaries for commissioner and his assistants are limited to one per cent. of the company's operating allowance in any one month, except that in checking construction ac-

count, the commissioner may spend not exceeding one per cent. of the estimated cost of the proposed additions, extensions and betterments. The commissioner is the technical adviser of the City Council. He has very little ultimate authority except in the way of the examination of the company's accounts and practices. Backed by the City Council, however, he has absolute control of car schedules and service. Nearly every other question of dispute between the city and the company may be referred to arbitration.

On March 1, 1910, the new plan started off with three cent cash fares and a penny-for-a-transfer, with no rebate. The company has spent more than the ordinance allowance both for operation and renewals. But the overdrafts in the funds, until authorized by the city or by arbitrators, do not affect the interest fund, which determines the fare. On June 1, 1911, the interest fund having passed the $700,000 mark, the fare was reduced one notch to three cents, with penny-for-a-transfer and penny rebate. That is practically three cents straight, as the thrifty Clevelanders do not buy transfers unless they are sure of using them, in which case they get their money back. A passenger may buy five tickets for fifteen cents, but unless he does buy tickets he must present the exact change, three pennies for one ride or six cents for two, or the company will keep his nickel. In practice a little more than one per cent. of the rides are at the nickel rate. From June 1, 1911, to the present time, the three cent fare has been maintained. This is in spite of a deficit in the operating and renewal fund. For a period of eight months in 1911 the city allowed the company an extra cent per car mile for operation. Otherwise the allowances have been as set forth in the ordinance. During the first year the company spent and took about $199,000 more than the gross receipts, and during the second year about $362,000, making the gross deficit for the two years about $561,000. That is practically equivalent to the penny-for-a-transfer charge for one year. It should also be noted that the city fare is maintained to the suburb of East Cleveland under an old franchise requirement at a heavy annual loss estimated by the city at not less than $300,000. In Cleveland, when tracks, cars, etc., are replaced their full original cost is charged to maintenance, while in Chicago only the original appraised value is so charged.

Cleveland is getting fair service at a three cent rate. It may be that the increase in traffic will overcome the deficit thus far accrued. The city Street Railroad Commissioner has ordered a hundred new fifty-five foot inside measurement trailer cars to cut down operating expenses and relieve the rush hour traffic. Gross receipts in April, 1912, were about $4,000 greater than 1911, in spite of the lower rate of fare which represented a loss of approximately $50,000 revenue. In Cleveland the city has a right to designate and order improvements to the amount of $2,500,000, which are to be made this year or next. Extensions, betterments and improvements, generally, may be ordered by the city, and the company must make them, if it can, acting in good faith, secure the funds, unless it claims that the proposed expenditures will impair the future ability of the property to earn the stipulated return on investment. In that case the matter goes to arbitration. The city cannot, however, propose any improvements after it has let the franchise come within fifteen years of expiration. Improvements proposed by the company may be made if so approved by the city.

Cleveland has made the same mistake as Chicago in permanently capitalizing franchise and pavement values; and making no provision for reduction of the capital, except during the fifteen year period to the expiration of the franchise. The people are being saved a lot of money. The company's motive for economy is destroyed, but thus far expenditures are being pretty well held in check by arbitrary provisions of the ordinance and the supervising alertness of the City Commission and the City Council. It is reasonably certain that in spite its low fare and no profits, Cleveland will not have any harder time than Chicago in buying out the local street railway system.

The experience of the two cities points to one conclusion, namely, that if the municipalization is to be either actual or potential, all franchise values and superseded and imaginary property must be wiped out of the permanent capital account. If this is done and the city wishes to municipalize, it can do so by requiring the property to pay for itself out of earnings. The increased safety of the investment will alone pretty nearly supply the amortization fund without any higher fares. This seems to be the only practicable plan of municipalization that does not involve the assumption by the city of enormous additional debts.

## POWER DEVELOPMENT VALUES.

Much is found in the recent technical press notes relative to capitalization of water rights. The California Railroad Commission has recently encountered the problem in the fixing of rates in and about Redding in which the public utility supplying the light and power to northern counties desires to place a valuation on its water rights aggregating some eight millions of dollars.

The possibility of creating values by power development is shown by the plans adopted by the city of Los Angeles for bringing a municipal water supply from the Owens River to that city. The value of the water supply would have justified the cost of constructing the aqueduct which will bring pure mountain water a distance of 250 miles in sufficient quantity to supply a city of 2,000,000 inhabitants.

The system will deliver 258,000,000 gallons (net) every twenty-four hours into reservoirs located nearly 1000 feet above the city. It consists of 98 mlies of covered conduits, 40 miles uncovered, 21 miles of open canal, 12 miles of inverted syphons, 43 miles of tunnels 10 to 13 feet in diameter, and 4 reservoirs along the line holding three months' supply.

The total cost will approximate $25,000,000, and the water power incidentally created will be utilized in producing 120,000 horsepower peak load of electrical energy, the sale of which will provide a fund large enough to cover the interest and create a sinking fund that will eventually pay all the bonds issued to cover the cost of both the aqueduct and the electrical power.

The people of the city of Los Angeles will, therefore, eventually become the absolute owners, without cost to them, of one of the largest municipal water systems of the world, together with the electrical power and the income from the sale thereof, after the payment of the bonds.

# WESTERN LAWS OF ELECTRICITY AND WATER

## IRRIGATION DISTRICTS.

BY A. E CHANDLER.

### Irrigation Districts in Colorado and Idaho

As shown by the above table from the Census report, both Colorado and Idaho have been active in irrigation district enterprises. It has been stated above that the irrigation districts in Idaho must be reported upon by the state engineer. The wisdom of such a provision and the dire need of it in Colorado is clearly shown by the following extract from the Biennial Report of the State Engineer of Colorado for 1909-1910:

> It is believed that the organization and financing of irrigation districts should be subject to some sort of state control. The present irrigation district law, while facilitating the formation of mutual enterprises in which each man in securing the irrigation of his own land helps to irrigate that of his neighbor, unfortunately lends itself to the manipulation of shrewd and unscrupulous promoters who do not hesitate to take advantage of ignorance on the part of many landowners with regard to financial and engineering problems to promote districts which may or may not have within them the elements of success.
>
> The experience of the State Board of Land Commissioners during the past two years, in which this Board has found it necessary to cut in two in many cases the areas proposed for irrigation under the Carey act, indicates that a similar regulation and control of irrigation districts would be for the good of all concerned. The irrigation district law should be so modified that no issue of bonds for construction purposes can be made until the enterprise has been approved by the State Board of Land Commissioners. From now on this Board will always have an engineer as one member. It can, furthermore, always command the services and assistance of the state engineer's office in any investigation which it sees fit to undertake. It is, therefore, believed that it is the proper official organization to exercise control over irrigation districts.

The 1909-1910 Report of the State Engineer of Colorado contains statistical data for seventeen irrigation districts, voluntarily furnished by the district secretaries. The 1909-1910 report of the state engineer of Idaho contains reports showing the existing conditions of fourteen districts—which reports are made by the district officers to the state engineer in accordance with a provision in the district act.

The suggestion quoted above from the report of the State Engineer of Colorado should be incorporated in the district act of every state, although, as stated, Idaho, Oregon and Wyoming provide for reports on the feasibility of the projects by the State Engineer. The 1911 amendments in California are designed to give existing districts so desiring a financial standing and do not provide for an examination on the part of the state before the organization. The reason most generally given for the failure of the early districts in California was the lack of proper supervision although the fact that the movement was premature and attended by the difficulties incident to rapid colonizing of new territory was an important contributing cause of failure.

### Advantages and Disadvantages of the District Organization.

When the first irrigation district act was passed in California in 1887, the only large irrigation enterprises existing were those owned by corporations (the so-called commercial enterprises) delivering water to landowners having no interest in the works. A novel feature of the district plan was therefore the provision for community ownership. The status today is different. A large number of the commercial enterprises have become mutual or co-operative (that is, the landowners own the irrigation works) and the extensive projects now being operated or constructed under the Carey Act and the Reclamation Act will ultimately be managed as mutual enterprises. The district act is therefore no longer unique in this respect.

Owing to its compulsory provisions it is easier to organize a large project under the district act than to form a mutual company for the irrigation of the same land. The irrigation district has, furthermore, a political prestige unknown to the mutual enterprise and has, therefore, far greater chances of securing favorable legislation.

At present the great obstacle in the way of further development by irrigation districts is the difficulty of financing them. In this the district is also not unique as other forms of irrigation enterprises have the same difficulty in securing money for construction purposes. The argument is often made that school districts and municipalities which depend for their existence upon the irrigation district, have no difficulty in selling bonds while those of the irrigation district go unsold. Bankers and bond houses answer that it is due simply to a lack of confidence: that many irrigation districts and other irrigation enterprises have failed while there are few cases of school district and municipal bonds proving bad investments. As stated above, an attempt has been made to remedy this trouble in California by legislation, but the general view is that no amount of legislation can increase the sale of bonds or increase the confidence in such, and that the only way of proving to the bond-buying public that the security is good is to show a number of successful irrigation districts.

Two states, Idaho and Oregon, have provided for the use of the funds of the United States Reclamation Service in lieu of part or the whole of a bond issue. There are certain legal obstacles in the way of the use of the "Reclamation Fund" for such purposes, even if there was a present surplus of money in such fund. The Reclamation Act provides that no water can be furnished to an individual owning in excess of 160 acres and also that the water user must be a resident upon or in the neighborhod of the land irrigated. An irrigation district organized under such restrictions would not be legally sound. It will be necessary, therefore, to eliminate the above restrictions from the Reclamation Act before the Reclamation Fund can be

used to finance irrigation districts. Furthermore, at the present time the fund has been entirely allotted to regular Reclamation Service projects so that no relief from such source is in sight for the irrigation districts.

Owing to the difficulty in disposing of irrigation district bonds at the present time—especially in California—the irrigation district has to pay far more for its construction work than it should. As the bonds carry but five per cent interest and must be sold at par, the ordinary way of handling both bids for the purchase of bonds and bids for construction work is by means of a combination between contractor and bond buyer whereby the bond bnyer buys the bonds at par and is reimbursed by the contractor who adds twenty or more per cent to his usual contract price. It cannot be claimed, therefore, that one of the first aims of the irrigation district act—that is, the saving of the profit of the middleman—has been brought about. Until irrigation district bonds are on the same basis as other municipal bonds, there will be little economy in the construction of such work.

The irrigation district act provides that the districts shall have the power of condemnation and this provision in the California act has been considered favorably by the United States Supreme Court (Fallbrook Irrigation District v. Bradley (164 U. S. 112). In California and a number of other Western states it is generally believed—although not so specifically held—that only public service corporations have the right of condemnation and that, therefore, a mutual irrigation company or a commercial enterprise for the irrigation of a large body of land for subdivision purposes would not have such right. (Although a digression, the point is here suggested that as the California legislature in 1911 passed a statute providing that "Irrigation in the State of California is hereby declared to be a public necessity and a public use, and the power of eminent domain may be exercised on behalf of such public use * * *," it is high time for a test case to be made by an irrigation company other than a public service corporation. There seems to be no good reason why a mutual company or a commercial enterprise irrigating a few thousand or more acres should not have the right of eminent domain as an irrigation district has.)

Aside from its power of eminent domain, the main advantage of the district organization is the authority of the majority to force the unwilling landowners to enter an irrigation enterprise. This power of the majority and the fact that (in most states) all voters within the district, whether property owners or not, may vote on matters pertaining to the management of the district, is thought by many to be detrimental to the best interests of the district. It is thought that under such conditions the management of the districts is likely to fall into the hands of politicians rather than the more able business men of the district. As to the compulsion exerted to bring unwilling landowners into the districts, this is now of less importance as the interest in irrigation is so great at the present time that there is little objection in any district to its formation and therefore this advantage is more theoretical than real in a number of instances.

## SCHEDULE OF HEARINGS BEFORE CALIFORNIA RAILROAD COMMISSION.

August 13, 2 p. m. App. 142—Coast Counties Gas & Electric Company, for permission to purchase the capital stock of the Gilroy Gas Works; before Commissoner Thelen at Gilroy

August 14, 10 a. m.—Case 284—Betts v. People Water Company; before Commissioners Loveland and Thelen at San Francisco. At 2 p. m.: General Order 26—Governing clearances and construction at crossings of railroads, etc.; before Commission in bank at San Francisco.

August 15, 10 a. m. Case 282—City of Berkeley v. Southern Pacific Company; before Commissioners Thelen and Gordon at Berkeley.

August 16, 10 a. m. App. 147—Mt. Konacti Light & Power Company. App. 162—James A. Gunn Jr., for certificate of public convenience and necessity, Kelseyville, Lake County; before Commissioner Loveland at Lakeport.

August 17, 10 a. m. App. 144—Tulare Big Four Electric Railway Company, authorizing issue of capital stock, par value $35,000; before Commissioners Eshleman and Gordon at Tulare.

August 19, 10 a. m. App. 169—Southern California Mountain Water Company, permission to sell, etc. Case 261—Palmer v. Southern California Water Company; before Commissioner Eshleman at San Diego. App. 154—Los Gatos Ice, Gas & Electric Company and Pacific Gas & Electric Company, authorizing the sale by the former to the latter of its entire property; before Commissioner Loveland at Los Gatos.

August 20, 10 a. m. App. 173-174—Southern Pacific Company and Atchison, Topeka & Santa Fe and other companies, re-contract joint use of line; before Commissioners Loveland and Thelen at San Francisco. At 8 p. m.: App. 89—Raymond Telephone Company, to increase rates between Raymond and Pines; before Commissioner Gordon at Raymond.

August 21, 8 p. m. App. 71—W. H. Moffett & Sons, for permission to raise rates in Lemon Cove; before Commissioner Gordon at Lemon Cove.

August 22, 10 a. m. App. 118—James A. Murray and Ed. Fletcher, to increase water rates to county of San Diego; before Commissioner Eshleman at San Diego.

August 23, 10 a. m. App. 55—Imperial Telephone Company for permission to increase rates in Imperial County; before Commissioner Gordon at El Centro.

August 26, 10:30 a. m. Case 264-266-270—San Mateo County Development Association, Chamber of Commerce, Palo Alto, W. E. Bean v. Southern Pacific Company, re-pass rates, before Commissioners Loveland and Thelen at San Francisco.

August 27, 3 p. m. Case 269—Phillip Duffy to define territory served by Napa Valley Electric Company; Pacific Gas & Electric Company v. Great Western Power Company; before Commissioners Gordon and Thelen at San Francisco.

September 2, 10:30 a. m. App. 112—Southern Pacific Company to cancel commodity rates; before Commissioner Eshleman at San Francisco.

September 3, 10 a. m. Case 293—Applications of various public utilities for permission to deviate in certain classes of cases from published schedules; before Commissioners Eshleman, Thelen and Edgerton at San Francisco.

September 4, 10 a. m.—App. 136—Santa Clara Water & Irrigating Company, for order to increase rates in Ventura County; before Commissioner Edgerton at Ventura.

September 5, 10 a. m. Case 274—Pacific Gas & Electric Company v. Great Western Power Company; before Commissioner Thelen at San Francisco.

September 6, 10 a .m. Case 253—Absorption of storage charges; before Commissioners Eshleman and Edgerton at Los Angeles. App. 64—Petition for rehearing by Western States Electric Company before Commissioner Thelen at San Francisco.

# JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE

Technical Publishing Company

Rialto Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
ROBERT SIBLEY, Treasurer and Editor in Chief
C. L. CORY, Secretary and Special Contributor
A. M. HUNT, Director and Special Contributor

**On Library Cars of all Southern Pacific Trains.**

TERMS OF SUBSCRIPTION

| | | |
|---|---|---|
| United States, Cuba and Mexico | per year, | $2.50 |
| Dominion of Canada | " | 3.50 |
| Other Foreign Countries within the Postal Union | " | 5.00 |
| Single Copies, Current Month | each | .25 |

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July, 1895
Entry changed to "The Journal of Electricity," September, 1895.
Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1899.
Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," Weekly.

FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN


## CONTENTS


Coast Counties Gas and Electric Company ..... 127

How the Chicago and Cleveland Street Railway Settlements Are Working Out ..... 134
*By Delos F. Wilcox.*

Power Development Values ..... 137

Irrigation Districts ..... 138
*By A. E. Chandler.*

Schedule of Hearings Before Cailfornia Railroad Commission ..... 139

Editorial ..... 140
The International Electrical Congress.
Telephone Versus the Power Line.
Growth of High Voltage Transmission.

Personals ..... 142

Trade Notes ..... 142

Commission Hearing on Overhead Crossings ..... 142

Electrical Development League ..... 142

News of California Electrical Contractors ..... 142

Co-operation Among the Electrical Trades ..... 143
*By Albert H. Elliott.*

The Proper Method to Figure Labor and Get Results ..... 144
*By L. C. Aimes.*

Industrial ..... 145
O. B. Trolley Base.
C. B. & Q. Railway Extending Its Telephone Lines.
Vitrified Clay Bus Compartments.

News Notes ..... 146


**The International Engineering Congress**

Charles C. Moore, President of the Panama-Pacific International Exposition, addressed the Engineers' Club of San Francisco at the Palace Hotel last Tuesday noon. As the event to be celebrated in 1915 is that of the accomplishment of the world's greatest engineering feat, timely and enthusiastic planning for the great international engineering congress of 1915 would but bespeak the world-wide engineering interest in this event. Western engineers are making considerable progress in the pledging of a ten-thousand-dollar guarantee to the great national engineering bodies as a token of western confidence in the successful outcome of the proposed world's engineering congress.

It is now none too early to go after the detail planning of the great event. The lively and active planning of the committee appointed by the American Institute of Electrical Engineers in formulating the International Electrical Congress for 1915 may well be emulated by those having in charge the general engineering congress for that year. Great bodies move slowly and it has been said on more than one occasion that even the "mills of the gods grind slow and exceedingly small." A little Western engineering gunpowder, however, like boarding house butter, goes a long way. It is to be hoped that immediately upon the proposed guarantee being assured a unified and emphatic western protest will be made to the eastern engineering bodies to take positive and complete action in the matter.

---

**Telephone Versus the Power Line**

In the modern, rapid rise of the great industries many things have entered with dark and ugly features to warp out of proportion or else to delay the ultimate advance of the engineering art.

The building of great smelters to handle our undeveloped mineral resources has resulted in a district-wide outcry from the agricultural interests circumscribing the smelter-plant. Indeed so determined, and in many cases so just, has been this protest that the courts have seen fit to permanently enjoin the operation of the smelter. The result is that large sums have been expended and are even now being expended by the Federal Government and by the interests at stake, to completely solve and do away with the smelter smoke nuisance. All parties to the issue, in fact, fully appreciate that the real solution of the difficulty is not by injunction but by putting to a useful application the enormous waste products belching forth from the smelter stacks instead of allowing them to devastate in many cases thousands of acres of productive agricultural land.

Now comes the annoyance to telephone lines from the electro-magnetic effects of near-by power lines. The rapid rise of long-distance transmission following quickly upon the phenomenal growth of the rural

telephone has brought about a dangerous situation.

In the early days of the city traction lines the grounding of the telephone return brought about serious inductive difficulties. This was met by the telephone companies in their establishing of complete metallic circuits. The interference of the long-distance transmission with the telephone lines may be said to be completely solved in certain special instances. These instances largely comprise the cases in which the telephone line and the power transmission line bear definite and symmetrical juxtaposition relative to each other and to the earth. Under such circumstances inductive effects may be mathematically calculated and proper allowances made for them. The recent advent of the electrically operated pump for the arid West, however, introduces new inductive complications. The modern up-to-date farmer must have not only his electrically operated pump and all the other household niceties and comforts which the power company is able to supply, but the rural telephone seems also to have become as staple as the milk and vegetables which supply his daily table.

Forty acres and less seem to be the economic unit for intensive cultivation in the West. In supplying the power necessary and the telephone service demanded by the farmer, it is seen at a glance that the net-work of power and telephone wires crossing and recrossing each other in ever-changing variations covering our entire rural communities, is introducing inductive complications of so serious and so perplexing aspects that only the deepest study and scientific investigation can ever successfully solve.

The telephone and the electric power supply may now be well said to be indispensable in the economic development of the great arid West. Not only are the gigantic fortunes invested in these securities at stake but the growth of our rural communities demands that this problem be solved. Some may say that like the "lion and the lamb," the telephone and the long-distance transmission line can never be made to lie down together except in wild imagination or in biblical prophecy.

If such pessimistic conclusions had held sway in former dark and foreboding situations many of the now famous engineering accomplishments would never have been brought to realtiy.

The people of the great State of California have recently endowed their railroad commission with complete authority to regulate and adjust the problems arising between public utilities if in their opinion a risk of life and property is at stake. Several protests are now on file with the commission relative to the power line and telephone difficulty. The problem is one that cannot be hastily set aside or ruled upon. The California commission has already shown by its manly and fearless attitude that every interest of the people and the public utility is to be safeguarded. Here now is a problem affecting the great public utilities and every telephone user in the West. Undoubtedly a permanent solution of the difficulty may be accomplished under proper scientific investigation at this time, for conditions are new in the West and exceptional opportunities are offered for scientific experiment.

The attitude of the commission in disposing of the telephone protest against the power transmission lines will be interestingly watched by not only the people of California, but indeed it may be said by the electrical world at large.

---

**The Growth of High Voltage Transmission**

In the issue of this Journal of July, 1896—only sixteen years ago—appeared a description of the Big Creek Power Transmission, touched upon elsewhere in this issue under a description of the present holdings of the Coast Counties Gas & Electric Company. As unfolding the unprecedented growth of the electrical transmission art, it is interesting to quote a paragraph from this article of sixteen years ago:

> For some time it has appeared to the electrical engineers of the Pacific Coast that the energies of the transmission department of the Westinghouse Electric & Manufacturing Company have been centered in the great undertaking at Niagara Falls for the reason that during the past three years the Westinghouse Company has accomplished practically nothing in the way of long-distance transmission in the far West, although actively engaged in the middle and eastern states. It is true that the Westinghouse Company was the pioneer concern to engage in transmission undertakings on the coast, as the interesting installations at Portland, Telluride, Bodie and Pomona attest, and it is possible that no single installation gave a greater impetus to electrical transmissions than did the successful achievement of the Westinghouse Company in the San Antonio plant in stepping up to 10,000 volts for long distance transmission purposes. Of late, however, the influences of the company have again been making themselves felt in this sphere, for it has now not only installed the transmission plant of the Big Creek Power Company of Santa Cruz, Cal., but will shortly place in operation the plant of the Central California Electric Company, extending from Newcastle to Sacramento and employing the *unprecedented potential of 15,000 volts.*

Baldwin and Burt of San Antonio Canyon fame, a score of years ago astonishing the world with their 10,000 volt, twenty-mile transmission, could hardly have dreamed of recent strides accomplished.

With the new Big Creek Power project now being constructed some sixty miles east of Fresno by the Pacific Light & Power Company of Los Angeles, even recent high voltage success is to be completely eclipsed. Power from this project is to be transmitted 275 miles into Los Angeles at a voltage between 150,000 and 175,000.

The only factor which seems now to impede the ultimate high limit of voltage transmission seem to be that point at which the break down point of air takes place, so remarkable has been the march and progress of the suspension insulator. In climates such as California produces we may confidently expect later transmission enterprises to go even higher than the Big Creek project of the Pacific Light & Power Company as all conditions seems to indicate that 200,000 to 250,000 volts may be safely utilized in high tension transmission.

## PERSONALS.

**G. M. Murphy,** manager of the storage battery department of Pierson, Roeding & Co., is visiting Los Angeles.

**V. R. Norris,** manager of the Arizona Electric Company at Phoenix, Ariz., is enjoying a two weeks' vacation at San Diego, Cal.

**C. B. Zabriskie,** a director in the United Properties Company, with headquarters at New York, is a recent arrival at San Francisco.

**J. T. Shaw,** an electrical expert connected with the State Railroad Commission, has returned to San Francisco after a summer vacation.

**John S. Baker,** district manager of the Crocker-Wheeler Company, is visiting Los Angeles, where the company now has a branch office.

**Sidney Sprout,** consulting engineer for the California-Oregon Power Company, has returned to San Francisco from the Klamath River region.

**Rudolph W. Van Norden,** consulting electrical and hydraulic engineer at San Francisco, is making an engineering examination in Northern California.

**John M. Gardiner,** who has lighting and electric railway interests in Southern California, arrived at San Francisco from Los Angeles during the week.

**F. B. Gleason,** manager of the Western Electric Company's San Francisco branch, has returned to San Francisco after visiting New York and Chicago.

**William Clayton,** general manager of the John D. Spreckels interests at San Diego, including the San Diego Electric Railway Company, is a San Francisco visitor.

**Clarence Follis,** who was for a number of years connected with the Brooks-Follis Electric Corporation, but is now a business man of New York, is visiting San Francisco.

**R. F. Oakes,** president of the American Ever-Ready Company, San Francisco, is making an automobile tour of the Lake Tahoe region with his family and will be absent several weeks.

**J. H. Wise,** assistant general manager of the Pacific Gas & Electric Company, has returned to San Francisco, after an inspection of the work in progress on the new South Yuba development.

**Frank W. Darling,** sales manager of the Clay Product Company of Chicago, spent part of this week with the company's Pacific Coast representatives, Stewart-Fuller Company of San Francisco.

**H. E. Sanderson,** Pacific Coast manager for the Bryant Electric Company, has returned to San Francisco, after accompanying **E. K. Patton,** the Western sales manager, on a tour of Oregon and Washington.

**K. G. Dunn,** with Hunt, Mirk & Company, arrived at San Diego during the past week to start work on the modern steam distribution system which is to be installed by his firm for the United Light, Fuel & Power Company.

**Elmer Dover,** president of the Tacoma Gas Company, is in supervisory charge of the Pacific Coast properties of the H. M. Byllesby Company during the absence of **C. E. Groesbeck.** The headquarters will be moved from Portland to Tacoma.

**R. Worth,** who was for two years district sales manager of the Northern Electric Machinery Company of Vancouver, B. C., has just joined the San Francisco office of the American Ever-Ready Company. He will act as sales director for the Pacific Coast.

**Jesse W. Churchill and J. P. Churchill,** who are the principal owners of the California-Oregon Power Company, with headquarters at Yreka, are at San Francisco on business connected with a new hydroelectric development on which work has been started.

**R. H. Sperling,** general manager of the British Columbia Electric Railway, Ltd., which furnishes traction, gas and electric lighting services for the city of Vancouver, B. C., is on his way to London. He will spend some time in England, after attending a meeting with his board of directors.

**H. V. Carter,** president of the Pacific States Electric Company, announces the addition of seven new salesmen to their force, including H. C. Bowers, formerly with the Newberry Benheim Electric Company of Los Angeles, as lamp specialist at San Francisco, and W. L. Ingalls as specialist on pole-line material at Portland.

**J. A. Lighthipe,** electrical engineer with the Southern California Edison Company; **J. E. Macdonald,** secretary of the Joint Pole Committee at Los Angeles, and **E. R. Northmore,** electrical engineer with the Los Angeles Gas & Electric Company, were among the engineers attending this week's hearing of the California Railroad Commission on the new order regarding overhead crossings.

## TRADE NOTES.

The Wagner Electric Manufacturing Company has secured a contract for all of the generators and motors required for lighting power purposes at the new plant of the National Borax Company in Ventura County, Cal.

The H. W. Johns-Manville Company was awarded the contract for the electric fixtures for the ground floor, offices, and the show cases of Hale Bros.' new store at San Francisco. Linolite reflectors will be used in the show cases and Frink direct-indirect reflecting electroliers, with opalescent bowls, for the store and offiec lighting.

## COMMISSION HEARING ON OVERHEAD CROSSINGS.

The California Railroad Commission held a hearing on August 14 with regard to its proposed order regulating overhead crossings of power and telephone lines as well as railway tracks. Representatives of most of the large power companies were in attendance to protest against several of the requirements which would necessitate the complete reconstruction of almost all present distribution lines and the commission engineer was authorized to prepare new specifications, the committee ruling that this order would not be retroactive.

## ELECTRICAL DEVELOPMENT LEAGUE.

The regular monthly meeting of the Electrical Development League was held at San Francisco on August 13, with an attendance of about 60 members. J. E. McDonald, secretary of the Joint Pole Committee of Los Angeles, spoke of the benefits of co-operation as exemplified by the work of his committee at Los Angeles. W. W. Hanscom read an interesting paper on the electrical equipment of the new temporary city hall. The membership committee reported a total of 152 members to date.

## NEWS OF CALIFORNIA ELECTRICAL CONTRACTORS.

The John G. Sutton Company were awarded the wiring for the Geary-street car barns at approximately $8000.

The Pacific Fire Extinguisher Company was awarded the wiring for the Lux school for the sum of $5100.

Bids are being taken on electrical work for St. Ignatius church. Charles T. L. Devlin is the architect on this large job.

At a regular meeting of San Francisco District, Local No. 1, California State Association of Electrical Contractors, Mr. McMean of the Southwestern Surety & Insurance Company, went into a very careful explanation of the compensation and the liability clauses of the Rosebury Act.

The Contractors' and Dealers' Association at a regular meeting passed a resolution to the effect that, after September 1st, all special contractors would carry a card and not work for any one found guilty of peddling a bid, and who did not pay their bills.

Messrs. Hanbridge, Arbogast and Phillips were appointed by the California State Association to assist in getting all electrical work segregated.

# THE ELECTRICAL CONTRACTORS' DEPARTMENT

## CO-OPERATION AMONG THE ELECTRICAL TRADES.

BY ALBERT H. ELLIOTT.

You have been told so much about co-operation that I imagine you thirst for new ideas and a new method of presenting them. It is with some hesitation that I come before your convention to preach the same old sermon in the same old way. The idea is as fundamental as the Ten Commandments. It is as simple and as easily understood as the addition of numbers. Why, then, do we keep repeating these simple things? The answer is that we do not always practice the things which are obvious and which we know to be sound, and we shall keep on with the process of education until at least a large majority of those engaged in the same line of business shall come to see the light.

We have no schools and colleges in which those engaged in the electrical business can be educated in the simple great economic truths underlying their business. For the present, associations and their conventions and meetings must do the work. You are to listen, then, for a few minutes to a lecture which has for its subject a very simple theme, and I shall try to present it in a simple manner.

The process by which raw material is taken from the ground, wrought into electrical goods by the skillful fingers of the manufacturer, transported in bulk quantities to the jobber, spread on the jobber's shelves where the contractor may pick and choose, placed by the contractor in the home or business building of the ultimate consumer—this process is a great fact, as old as the laws of business itself. We did not make this process and we cannot but change it but slightly as the years roll around. So long as we are a legitimate part of the process, we should be satisfied to render our portion of the service by which goods are manufactured and sold.

The channels of trade have been cut in the geological strata of the business world for ages and ages. I think it is fair to assume that the process will go on in the same way for a long time to come—such a long time that there is no use asking the question as to whether this or that branch of the industry shall be done away with. If we are satisfied that the electrical contractor—the man who takes the goods from the shelves of the jobber and installs them—is a part of the channel, so to speak, then we can begin to investigate our subject without fear that we shall be charged with making an aeroplane journey into the light upper air of pure theory.

At the very start I oppose competition—that is, the kind of competition which the word usually connotes—to co-operation. There is competition of service and quality which is not opposed to the idea of co-operation but is a necessary incident of it. Competition in mere price, however, with its expensive armaments and standing armies, is opposed in idea to co-operation for a very obvious reason.

In no part of the process of the creation and distribution of electrical goods does there seem to be room for the suggestion that the goods can be sold for less than the cost of production for any length of time without wrecking the entire process. This is one of those simple truths which we must get into our system by a process of repetition. We want every man engaged in the electrical business to be inoculated with it. We want the germ to get into his system, until he breaks out with a rash and spreads the virus to all with whom he comes into contact in his business world.

We want it to work both ways, so that neither will you try to sell goods or do work yourself for less than cost, nor will you ask the other fellow to do it. We want your business itch to be so strong that an uncomfortable irritation will be immediately set up when the idea gets into your heads that you are smarter than the others and can sell goods or do work for less than cost and succeed, where others have failed.

The consumer should not be forgotten, and I want to speak a word for him today. Too often is he forgotten at these business conventions where we are all busy finding out how we can shove more goods at him, at a higher profit. There is no true co-operation which ignores the consumer. Here is another of the simple ideas which will bear repetition. When you find a group of business men putting up a job on the consumer, you can look for as much co-operation as you would find between the Barbary pirates and the crew of a Spanish galleon.

The consumer wants two things above all else—good service and good quality. Of course, the price should be reasonable—that is, a reasonable advance on the actual cost of production. But the consumer demands that his house shall not be burned by your poor goods and your bad installation. He knows that good goods and first-class installation cannot be procured at less than cost. You co-operate with the consumer when you give him "good goods," installed in a first-class condition. You hurt the consumer when you give him bad goods, poorly installed.

If because of a freebooter struggle with your neighbor in business you make up your inevitable losses by cinching the consumer through the simple process of bad material and worse installation, the system of co-operation breaks vitally at its ultimate point. And notice how the break shatters the entire structure.

Where do you get your bad material? You cannot keep up the foolish fight with standard goods, and you begin to hunt around for material that looks enough like standard to fool the unwary eye of the consumer. Here is the second break in the chain of co-operation. Possibly you can find a jobber who will in turn find a manufacturer who will produce the article your are looking for. What a splendid plan it is! So long as standard goods are maintained all the general co-operative structure stands. What a nice little time you are having, even if you do bring in an earthquake now and then. You are content for others to hold up the structure even if you do crack it some. But when it falls, where are you with your pretty plan of chicanery? You are the first to go under, because in a business storm the houses not built upon the solid rock of business probity are swept away.

We must see, then, that real, true co-operation is not a theory, or a mere ethical maxim. I am not preaching a sermon to you—good in convention days, but not to be practiced during the working week. It is the distinction between selfishness and self-interest which should be borne in mind.

Very often a wise man is born into the electrical business. He knows so much better than those who have breathed electric currents all their lives that he wants to show them a thing or two. Like the crank who fiddles with perpetual motion, he must have a demonstration. If any of you think that you are such a wise man—a meteor shot athwart the black sky of the electrical business—get your demonstration before you enter the business. Study the methods of the wisest heads in the American business world today. You may pull a few others down with yourself in your reckless experiment, but we can guaranty that you go down yourself, because the laws of business are as inevitable as the laws of gravity, and if you can prove that goods can be sold at less than cost at a profit, you should be addressing this convention on the subject, "How to 'blow in' profits and not 'blow out' your business."

Co-operation, then, has taken the place of bare-clawed competition. We have progressed far from the jungle days of business. We want to live and let live. Our competitor is not our natural enemy. Business is not made from the backs of others. A rational harmony indicates healthful business conditions.

---

## THE PROPER METHOD TO FIGURE LABOR AND GET RESULTS.

BY L. C. AIMES.

In the installation of the electric wiring in a building, there are many items that have to be taken into consideration, when estimating the amount to be charged to labor. One who has served his time in the electrical construction business, naturally has quite an advantage over the man who figures on the plan of so much an outlet, so much wire per day, so much pipe per day, so much an apartment, or so much a floor.

The first item to be considered, and a very important one, is the location of the job, and how easily you can place your men and material on it. As an example, we are installing the electric work in St. Joseph's Orphanage, a building somewhat inaccessable. We have noticed that our men are occasionally late, owing to the distance and the poor car service. It has also cost us more to place the material on the job than we had anticipated and figured. Therefore we say that location has considerable to do with estimating the labor on a job.

Secondly—The disposition of the architect with whom you are dealing must be taken into consideration; is he a man who will help you out of a difficulty, should one arise, thereby lessening the labor in correcting it, or is he a man hard to deal with, and who will try to unload his own mistakes upon you, and force you to correct them at your expense, thus adding to the cost of labor.

Third—The contractor is another person who should be considered. If he is a man who understands how to put a job through with little delay, and does not necessitate your moving back and forth on the job several times before you can complete your part of the work, you can rest assured that your cost for labor on this job will be the minimum.

The method of construction of the building is an important matter to be taken into consideration when estimating the cost of labor. Sizes of floor joists, double or single flooring, furred or dropped ceilings and the height of ceilings are matters of great importance, and must receive careful attention in the labor charge.

Do not, under any circumstances be guided by the amount of material that may be allowed for any job, because you will soon find that no two contractors use the same methods in constructing buildings, therefore any set rule does not apply.

Do not fool yourself by thinking that you have a system where you can install pipe for 3 cents per foot or wire at ½ cent per foot, for such systems are not to be depended upon, and frequently fail. As I have stated before, no two jobs are alike, and this fact must not be lost sight of.

Take each job as it comes along and go into every detail of it carefully, for if you do not you may be forced to do so at some later date, to find out why your men are so long on the job, or why so much more material is called for after you have started.

Some people in figuring jobs are simply guided by the floor plans and never pay any attention to elevation details or to the specifications about floors, walls or ceilings. Strict attention to these details will nearly always save much labor.

The cost of labor on every job should be figured by at least two persons and more if possible. Each should figure separately, and when finished, they should compare figures. If all figures are the same or nearly so, the average of the three should be used. If any great difference is shown, the matter should be discussed, and each one show in which way he has found his estimate. Discussions of this kind are always profitable, especially upon such an important subject as labor.

I shall now endeavor to give you a short synopsis of the system which I believe to be correct, in figuring the labor on any job. As an example we will take a five-story building which contains thirty circuits, all to be placed in conduits. First number every circuit, and maintain that number throughout the job. Study each circuit carefully, for you will find that no two are alike. Then estimate the length of time it will take to install the conduit for each circuit. Next take up the time it will take to install the feed-pipes. Then take up the amount of time required to install conduit for telephone lines. This takes care of all the conduit and feed-pipes in the building.

Then estimate the time required to pull in the wire for each circuit, also all feed wires.

Then next for consideration, come the switches, switchboards, bells and telephones. The time required to install these should be figured separately. This practically completes the job.

From a labor point of view it is poor policy to furnish your men with anything but the best of material and tools. More time is lost in trying to work up some old junk than would be used in putting in two new ones. Remember that time is money.

Always endeavor to start every job at the right time. Do not start too early, before the job is ready for you, for you will have to kill time waiting for it to get ready. On the other hand it is bad policy to wait too long, and then try and rush the job, for something will be left undone, and you will be forced to go back and do it, which means extra labor—in other words, more expense.

Try and keep sufficient material on every job, to fully complete it, otherwise your men will be greatly handicapped, for you cannot expect men to work without something to work with.

In estimating the cost of labor do not be guided by the amount of labor that the best man you have on your force can perform. The best man you have may not be able to be on every job. It is far better to take a good average man as your base to figure from, and in doing so you will not miss your estimate for labor very far. Bear in mind that all men do not work at the same speed, and as I have stated before, do not always look for the speedy man, for after all it is the careful man that brings in results in the end.

Always make it a point to treat your men with respect, but at the same time do not allow yourself or them to become too familiar, for you will find that in time it is the best policy. You are always in a position to speak sternly if the occasion arises, and you will not hurt the feelings of any one, and they will respect you more for it. Do not let any employe feel that he has a life-job, for just as soon as he feels that way, he will surely take advantage of you, and your labor account suffers.

In selecting your foreman for a job, try and get a man who works steadily and conscientiously. It is not always the man who can perform the most labor that makes the best foreman, but the man who can get concerted action from a body of men. Steady concerted action always brings results.

Another word about material. In calculating the amount of material that goes into a job it is advisable to have some one check over the lists of the estimator, and see that nothing has been left out, for it is chargeable to labor, to have a man coming into the shop two or three times a week for small articles, when a little forethought would have avoided it.

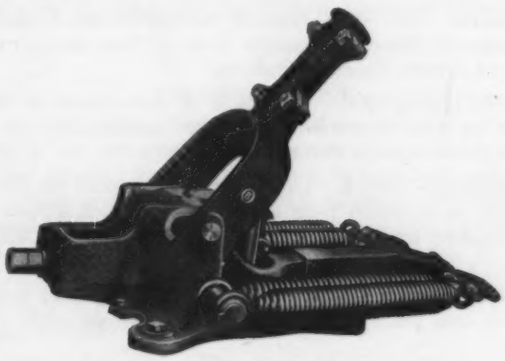
In conclusion, let me say that to get the best results from labor, it is necessary to use judgment in the selection of material, the proper time to place your men on the job, and in the choice of a foreman to run each job. Careful attention to these details cannot help but keep your cost of labor down to the lowest point, and we all know the importance of this.

# INDUSTRIAL

## O-B TROLLEY BASE.

The Ohio Brass Company of Mansfield, Ohio, has, after thorough service trials, placed on the market the new design of trolley base shown in the illustration. It is very simple in construction and possesses several original features, which make it a valuable addition to the equipment of an electric car.

The tension spring feature, which has proven very popular, has been incorporated in this design in such a manner as to give a very uniform tension on the trolley rope throughout the entire range of movement.



O-B Trolley Base.

The ends of the springs are formed over the cone-shaped ends of eye forgings, giving a substantial construction and reducing to a minimum the possibility of springs breaking. Special sleeve bearings, which may be easily renewed when worn, are provided between the fork casting and the forged rings at the ends of the springs.

The base rotates on improved roller bearings set in a cage so that they may be removed from the base as a single unit. The cage also prevents the rollers from becoming skewed and jammed in the case. For cleaning and oiling the bearings, it is only necessary to remove one screw when the whole mechanism may be lifted off the turret without even altering the tension of the springs. Since it is so easy to gain access directly to the bearings, no oil holes are provided in the casing, and it is, therefore, absolutely waterproof. Renewal of trolley poles in the car barn is greatly simplified by providing a hook for holding down the fork.

Buffing action is provided for by a compression spring and the sliding action of the yoke in such a manner as to prevent bending of the trolley pole and relieve the bearing of all unbalanced strains.

## C. B. & Q. RAILWAY EXTENDING ITS TELEPHONE LINES

The Chicago, Burlington & Quincy Railway Company recently placed an order with the Western Electric Company for apparatus to be used in extending its telephone train dispatching circuits. The successful operation of the present lines and the economy resulting therefrom has been the incentive for the extension.

At present, there is a train wire, operated by special No. 102 type selector sets of Western Electric Manufacture, from Kansas City, Missouri, to Napier, Missouri, with the train dispatcher at St. Joseph, thus working the circuit from St. Joseph to Kansas City on one end and from St. Joseph to Napier on the other. The extension will bring the train wire into Council Bluffs, Iowa, from Napier. This branch is now operated by telegraph and it will be simpler to operate the entire line by telephone, than by using a combination.

Fourteen special No. 102 type selector sets will be installed in way stations along the line to Council Bluffs. The dispatchers will be located at St. Joseph. The new line is approximately 95 miles long.

## VITRIFIED CLAY BUS COMPARTMENTS.

In the report of the Committee on Electrical Apparatus at the Seattle N. E. L. A. convention favorable mention was made of the use of hollow tile for the construction of bus

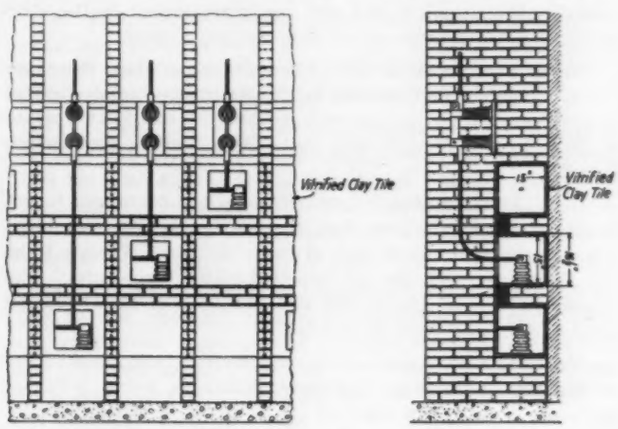



Fig. 1. Vitrified Clay Tile Bus Compartment.

compartments. These structures are so designed that they afford the necessary facilities for bus-bar supports and wiring and at the same time are cheaper and easier to install than concrete or similar materials which are now used for this purpose. Fig. 1 shows the method as proposed.

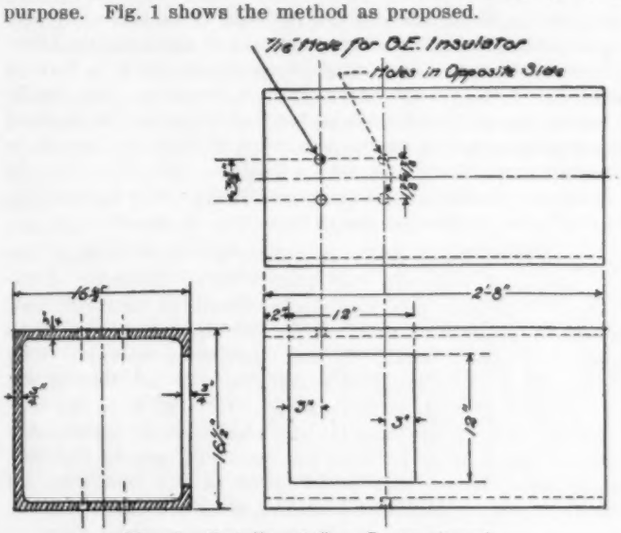



Fig. 2. Details of Bus Compartment.

Acting on the request of Stone & Webster the Clay Products Company of Chicago have designed and are manufacturing such compartments from vitrified clay for use in the Keokuk, Iowa, and Savannah, Georgia, plants, which Stone & Webster are constructing. Fig. 2 shows the detail of this design. The Clay Products Company are represented on the Pacific Coast by the Stewart-Fuller Company of San Francisco.

# NEWS NOTES

## ILLUMINATION.

ALHAMBRA, CAL.—The City Trustees have adopted an ordinance providing for a street lighting system that will form part of the boulevard from Alhambra to Los Angeles. Concrete lamp posts will be installed.

SAN FRANCISCO, CAL.—For the first time, the Western State Gas & Electric Company turned gas into the large new main on Sutter street last week. Manager W. W. S. Butler states that this is the largest gas main ever laid in this city.

ALAMEDA, CAL.—The City Council has fixed October 15 as the date for the sale of $157,500 of bonds recently voted by the people of the city for improvement in the electric light plant and for a new police signal system.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company has applied to the Railroad Commission for a certificate of public convenience and necessity to operate in the cities of Morgan Hill and Gilroy, and in San Benito County.

WINLOCK, WASH.—A deal has been consummated here whereby the Washington and Oregon Corporation, acquired the electric light plants and systems of the J. Veness Lumber Company, and the O'Connell Lumber Company. The Veness plant is a modern one and the plant of the O'Connell Lumber Company will be rebuilt.

SACRAMENTO, CAL.—The auxiliary electric plant of the Pacific Gas & Electric Company, which is being built on the water front a few hundred yards north of the city limits to supply Sacramento with power, should the transmission wires from the hydraulic plant become disabled at any time, is nearing completion. When the building is completed and the machinery it is to cover is in place the plant will represent an outlay of $744,000.

SAN FRANCISCO, CAL.—The Pacific Light & Power Corporation has applied to the Railroad Commission for permission to purchase tangible properties of the Glendale Light & Power Company, consisting of equipment used to furnish light and power to the inhabitants of Tropico. The Pacific Light & Power Corporation states that if permitted to make the purchase it will reduce the price of light and power in Tropico from fifteen to nine cents per kw., that it will reduce the minimum monthly charge from $1.50 to $1, and that it will make all service connections free of charge.

PORTERVILLE, CAL.—Engineers are now working out the plans and work will start shortly on an extension of the Central California Gas Company's system in this city and when the plans have been carried out the mains will reach practically every house in this immediate district. The mains will also be extended outside the city to many of the more thickly settled orchard district. Material is on the way from the mills in the East for the high pressure distribution system, which is to be used for conveying gas to Lindsay, Sharthmore, Exeter and other towns of the east side, all the red tape incident to certificates from the State officials and franchises from the towns having been granted them.

LOS ANGELES, CAL.—The municipality will compete with private light and power corporations for serving other cities. The Public Service Commission has decided on this step and voted to notify Tropico that Los Angeles will submit a bid to the trustees for supplying electricity to that place. The current will come from the aqueduct. The municipality can supply Tropico for 2½c a kw. hour during the on-peak period and at a rate of 70 per cent lower than it can supply itself during the off-peak period. Private corporations cannot meet these figures, it is understood. The light and power supply business of all the cities near by, such as Long Beach, Santa Monica, Venice, Glendale and Redondo Beach, is to be solicited immediately, and it is promised that the current will be flowing in within a few months.

## TRANSMISSION.

POCATELLO, IDAHO.—The bursting of a tank belonging to the Pocatello Gas & Power Company caused a loss of $5000.

CLAYBURN, B. C.—The British Columbia Electric Company is considering an extension of its line from this place to Mission City.

ELGIN, ORE.—Fire recently destroyed the Elgin Electric Light & Power Company's plant at this place, causing a loss of several thousand dollars.

PORTLAND, ORE.—Work is to be started soon on the extension of a car line from the present terminus of the Eastmorland line through Errol Heights.

PORTLAND, ORE.—The Hawthorne avenue car line will probably be extended from E 60th and Division streets to E 74th street by the Portland Railway, Light & Power Company.

POTLATCH, WASH.—The Mason County Power Company has been incorporated for $2,000,000 and will build its plant at this place to supply power to various parts of the county.

CENTRALIA, WASH.—Preparations are being made for building an immense power plant on Packwood lake, in the eastern end of Lewis county. It is intended to develop 100,000 h.p.

SAN FRANCISCO, CAL.—The Railroad Commission has received an application of the Southern Sierra Power Company for a certificate of necessity and convenience to operate in Inyo County.

WALLA WALLA, WASH.—It is reported that an electric line will be constructed from this place to Union, Ore., by W. A. Terrell, of Union, and others. A move has been made to locate a feasible route.

SALEM, ORE.—The proposal of J. P. Donovan to develop 15 h.p. a the mouth of the Clackamas River has been approved by John F. Lewis, state engineer. The project calls for the investment of $1,250,000.

DIXON, CAL.—An application has been made to the Board of Trustees by the Great Western Power Company for a franchise to erect transmission lines in the town of Dixon. Sealed bids will be received up to 8 p. m. September 10, for sale of said franchise.

FAIRFIELD, CAL.—An application has been made by the Great Western Power Company to the Board of Trustees for a franchise for electric transmission lines in Fairfield. Sealed bids will be received up to 8 p. m. August 27, for sale of said franchise.

WALLACE, IDAHO.—The Kootenai Power & Construction Company is the name of a new company which has been formed by Joseph A. Coram of Boston, to develop power at Kootenai Falls. Forty-five thousand h.p. will be developed. Incorporators are E. E. McWhitney and N. P. Coffin of Wilmington, Del.

SAN FRANCISCO, CAL.—An amended application of the Indian Valley Electric Light & Power Company has been received by the Railroad Commission to issue 100,000 shares of common stock and $250,000 in bonds for the purpose of additional construction, and also to issue promissory notes to the amount of $50,000.

PHOENIX, ARIZ.—Secretary of the Interior Walter S. Fisher has announced that he has approved the power contract between the local Reclamation Service and the Inspiration and Miami mines. Electrical engineer of the Reclamation Service, M. O. H. Ensign, will supervise the drawing of the plans for the transmission line.

EUGENE, ORE.—A power project rivaling that proposed by the Hill interests at Clark Lake in the summit of the Cascades, is nearing completion of the initial section by the building of a tunnel to tap Waldo Lake, likewise near the summit of the Cascades, approximately 40 miles south of Clear Lake. As a power project the Waldo Lake plan contemplates the development of 35,000 horsepower, as compared with 34,000 horsepower, which is the theoretical possibility of the Clear Lake project. The Waldo Lake power plant at Oakridge would be 40 miles from Eugene, the greatest market, as compared with 75 miles for the Oregon Electric's Clear Lake plant.

## TRANSPORTATION.

TULARE, CAL.—Sealed bids will be received up to September 3, for the sale of the franchise applied for by the Big Four Electric Railway Company, to construct and maintain a single or double track electric railroad in this town.

SAN FRANCISCO, CAL.—A modified application has been filed with the Railroad Commission by the San Jose Terminal Company, organized to build an electric line from Alviso to San Jose with steamers connecting at Alviso for Sacramento, to issue $650,000 in 5 per cent bonds.

STOCKTON, CAL.—The Stockton Terminal & Eastern Railroad, which has been running for some time between Stockton and Linden, has built a skeleton track to Bellota and begun service to that point. It is proposed to continue the road to Jenny Lind, Calaveras County.

SAN FRANCISCO, CAL.—Treasurer Benjamin S. Guinness of the United Railways Investment Company, announces that the principal and interest of its series H 6 per cent notes of 1908, maturing August 15 next, will be paid by the New York Trust Company, or at the office of the United Railroads of San Francisco on presentation and surrender.

OLYMPIA, WASH.—With the secretary of state has been filed a copy of the resolution adopted at a meeting of the Washington & Oregon Corporation held in Philadelphia, May 7, authorizing and directing the extension of the Chehalis-Centralia Interurban line from the Centralia terminus in Lewis county, by way of Tenino to the southern terminus of the Olympia Light & Power Company tracks in Tumwater.

WATSONVILLE, CAL.—The $100,000 wharf being built at Port Watsonville by the Watsonville Navigation & Railway Company, is nearing completion, and it is thought that the steamer line between here and San Francisco will be put into operation next month. President F. E. Snowden says the electric line which runs from here to the port will be first extended around the Pajaro Valley, and then to interior points, as the business develops. It is planned to run the steamer to San Francisco every two or three days loaded with the products of this section.

PORTLAND, ORE.—Petitions asking the council to grant a franchise for the extension of the Mount Tabor carline from East Sixty-ninth to East Eighty-eighth streets have been circulated in Montavilla and East Mount Tabor, and will be filed today. The petition asks the council to grant the franchise as soon as possible. It is further recited that by agreement with the Portland Railway, Light & Power Company the citizens interested agree to pay $10,000 toward the construction of this extension—one-half of the cost of the work—and that this money has been collected and deposited in trust in the Merchants Savings & Trust Company, subject to withdrawal by those contributing December 1, 1912, unless the extension is in operation by that time.

LOS ANGELES, CAL.—Engineers of the Pacific Electric Company have completed plans for the construction of a tunnel three and one-half miles through the hill from the Hill street depot to an outlet at Vermont avenue. The company is now waiting for favorable action by the charter revision commission giving power to the city council to grant the necessary franchise. The tunnel will enter the hill in the rear of the Hill street station. It will enter grade again in the Arroyo near Vermont avenue, where it is to connect with the westbound lines of the company. The main purpose of the tunnel is to provide a system of splendid rapid transit lines to Hollywood and the beaches and perhaps to Glendale, Burbank and elsewhere. The tunnel's cost will be about $7,000,000 or approximately $2,000,000 a mile.

## TELEPHONE AND TELEGRAPH.

WATTS, CAL.—The City Council will receive sealed bids up to September 17th for a franchise granting the right to construct and maintain for a period of 21 years a telephone and telegraph system along the streets of this town.

LOS ANGELES, CAL.—The American District Telegraph Company will have to obtain a franchise and pay two per cent of its gross receipts each year for the privilege of doing business in Los Angeles. The new franchise will compel the company to remove its wires from poles and place them in conduits.

WILLIAMS, ARIZ.—J. C. Griffith, general traffic supervisor of the Mountain States Telephone & Telegraph Company of Denver, Colo., was in Williams recently looking over lines acquired by the company, and extensive improvements in telephone service in northern Arizona will be made by the new company.

PORTLAND, ORE.—The Pacific Telephone & Telegraph Company has sought an injunction in the Circuit Court to prevent the Home Telephone Company, the Multnomah hotel and the R. R. Thompson estate from interfering with the telephone service in the hotel. The issue was forced by the Home Company in May, when the concern tied up the four leading hotels of the city in a conditional contract calling for the exclusive use of the automatic phone on the rooms of these hotels. J. C. Ainsworth, who is president of the United States National Bank, is also treasurer of the Pacific Telephone Company. He has been the leader of the interests backing the Pacific Company. Opposed to Ainsworth and the millions of capital affiliated either with his bank or friendly financial institutions, have been, it is said, the Ladd & Tilton Bank, the First National and other allied concerns. W. M. Ladd and A. L. Mills, the former at the head of the Ladd & Tilton Bank, the latter president of the First National, and Theo. B. Wilcox, the millman, are all directors in the Home Company. The result has been that the stock of the Home Company of Portland, which could be bought less than two months ago for $10 a share has now advanced to double and triple that figure. The owner of one block of stock, it is known, has refused an offer of $30 a share, and is holding its shares at $45.

## WATERWORKS.

OAKVILLE, WASH.—Sealed proposals will be received August 19th for furnishing materials and constructing a waterworks system.

WENATCHEE, WASH.—At Leavenworth the people will vote August 20, on the issuance of $44,000 in bonds for inaugurating a new water system. A new sewer system is also planned.

SIERRA MADRA, CAL.—The Board of Trustees will receive sealed bids up to September 12th for a franchise granting the right to construct and maintain water mains and laterals along the streets of the town.

# ALPHABETICAL INDEX TO ADVERTISERS


Aluminum Company of America ..... 1
American Bridge Company .....
Benjamin Electric Manufacturing Company .....
Blake Signal & Manufacturing Company .....
Bonestell & Company ..... 4
Bridgeport Brass Company ..... 4
Brill Company, The J. G. ..... 4
Century Electric Company ..... 3
Colonial Electric Company .....
Crocker-Wheeler Company ..... 3
Cutler-Hammer Manufacturing Company .....
D. & W. Fuse Company .....
Dearborn Drug & Chemical Works ..... 12
Electric Storage Battery Company .....
Fairbanks, Morse & Company .....
Fibre Conduit Company, The .....
Fort Wayne Electric Works .....
General Electric Company ..... 13-14
Habirshaw Wire Company .....
Hemingray Glass Company ..... 16
Hammel Oil Burner Company .....
Hughes & Company, E. C. ..... 12
Hunt, Mirk & Company .....
Indiana Rubber & Insulated Wire Company ..... 16
Johns-Manville Company, H. W. ..... 12
Kellogg Switchboard & Supply Company .....
Klein & Sons, Mathias ..... 4
Leahy Manufacturing Company .....
Locke Insulator Manufacturing Company .....
Lombard Governor Company .....
McGlauflin Manufacturing Company .....
Moore & Company, Engineers, Chas. C. ..... 5
National Metal Molding Company ..... 16
New York Insulated Wire Company .....
Northern Electric Railway Co. .....
Nuttall Company, R. D. .....
Ohio Brass Company .....
Okonite Company ..... 16
Pacific States Electric Company ..... 2
Pelton Water Wheel Company ..... 12
Pierson, Roeding & Company ..... 1-4
Pittsburg Piping & Equipment Company ..... 16
Safety Insulated Wire & Cable Company .....
Schaw-Batcher Company Pipe Works, The .....
Southern Pacific Company ..... 15
Sprague Electric Works ..... 8
Standard Underground Cable Company ..... 16
Stewart Fuller Company .....
Tracy Engineering Company .....
Thomas & Company, R. .....
Western Electric Company .....
Westinghouse Machine Company .....
Westinghouse Electric & Manufacturing Company ..... 6
Weston Electrical Instrument Company ..... 3



THE LARK
THE OWL
SHORE LINE LIMITED

3 Choice Daily Trains to Los Angeles

$14 One Way Round Trip $25

SHORE LINE LIMITED
Leaves San Francisco 8:00 a. m.
Arrives Los Angeles 9:50 p. m.
A delightful daylight ride down Coast Line. Observation, Parlor and Dining Cars.

THE LARK, via Coast Line
Leaves San Francisco 7:40 p. m.
Arrives Los Angeles 9:30 a. m.
Dining Car open 7:00 p. m. Standard Pullman and Observation Cars.

THE OWL, via Valley Line
Leaves San Francisco 6:20 p. m.
Arrives Los Angeles 8:35 a. m.
Buffet-Library Car, Standard Pullman, Observation and Dining Cars.

All Trains Electric Lighted.

SOUTHERN PACIFIC

SAN FRANCISCO: Flood Building Palace Hotel Ferry Building
Phone Kearny 3100
Third and Townsend Streets Phone Kearny 180
OAKLAND: Thirteenth and Broadway Phone Oakland 162



Eliminate Failures
— FROM —
Faulty Material OR Chafed Insulation
BY INSTALLING
TRADE MARK
BX CABLE
Flexible Steel Armored

A Coil of Greenfield Flexible Steel Armored Conductors.

The Rust-Proof Extremely Flexible steel armor makes BX CABLE the ideal material for installation in new or old buildings. On jobs requiring fishing and drawing in, it has no superior.

*Ask for Conduit Catalog 43654*

SPRAGUE ELECTRIC WORKS
OF GENERAL ELECTRIC COMPANY
MAIN OFFICE
527-531 West 34th Street, New York
San Francisco, Rialto Bldg. Seattle, Colman Bldg.